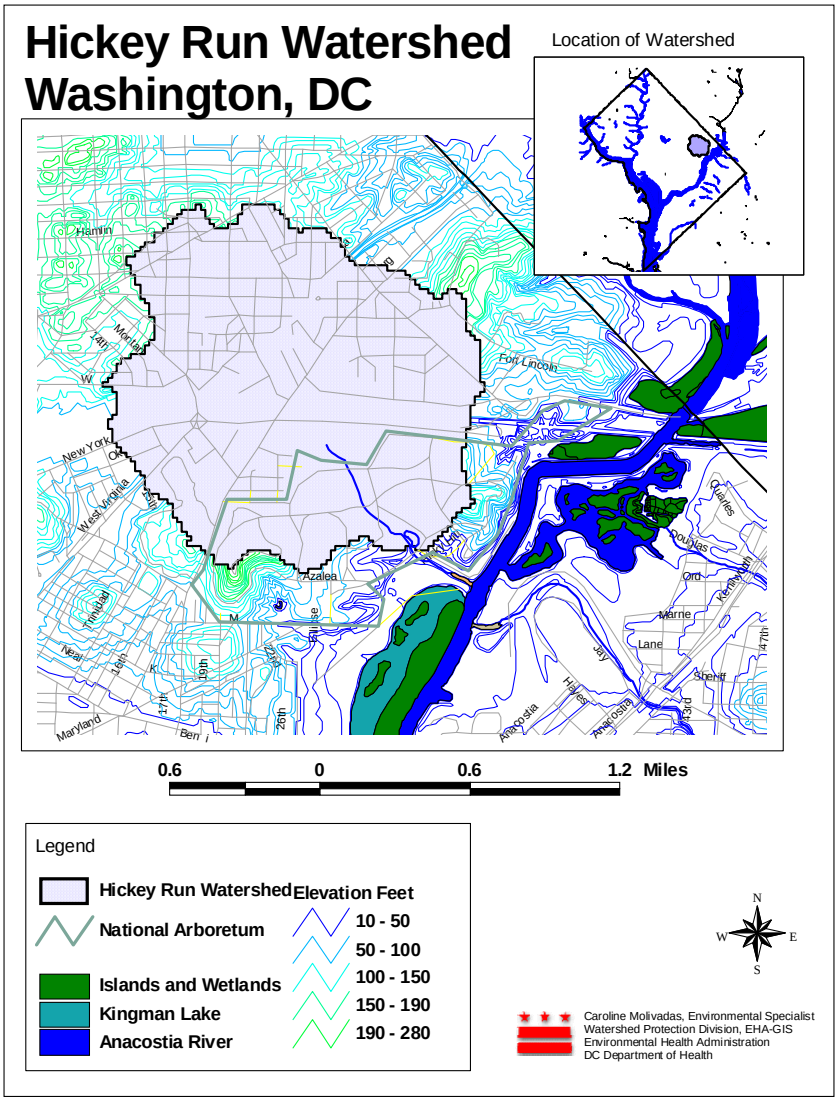
Watershed Implementation Plan

Hickey Run, DC



July 2005
District of Columbia
Department of Health, Environmental Health Administration,
Bureau of Environmental Quality,
Watershed Protection Division

FOREWORD

In July of 1999, the District submitted to the EPA the Anacostia River Watershed Restoration Action Strategy (WRAS). The EPA approved this document, and requested that any additional incremental funding be applied to projects outlined in the approved WRAS. In order for the District to receive incremental funding, the EPA required that the WRAS be updated to address the overall vision, to reflect progress that has been made in the implementation of the Anacostia WRAS, and to add new information necessary to update the status of the plans. This Hickey Run Watershed Implementation Plan (WIP), formerly referred to as a WRAS, is intended to serve this purpose. This is an updated version of the first Hickey Run WRAS.

Executive Summary

Hickey Run is a western tributary of the Anacostia River which flows approximately 0.9 miles southeast to the Anacostia. The total watershed area is roughly 1079 acres or 1.7 square miles. The upper half of Hickey Run's watershed lies in a heavily industrialized and mostly impervious area north of New York Avenue. The upper half of the stream is therefore essentially a piped "sewershed" and the lower half of the stream is fed by this complex storm sewer system. The lower half of the stream, the day-lighted half south of New York Avenue, traverses the USDA National Arboretum (USNA), and is its dominant drainage feature. Due to the nature of the heavily developed and mostly impervious upper reaches of its watershed, Hickey Run is heavily degraded. This is typical of most of the streams in the highly urban Anacostia River watershed.

Measures of water quality, physical and biological conditions of the degraded tributary have been recorded for more than 10 years by the District's Environmental Health Administration (EHA), among others. The Districts water quality report to Congress, report 305b, breaks down the most currently available cumulative data on Hickey Run. Note that Hickey Run has not met its swimmable and secondary contact uses in the last 10 years.

The stormwater drainage system for the northern half of the Hickey Run watershed conveys high peak flows with short times of concentration for even relatively minor rain events. These high peak flows have destabilized the stream channel and are causing severe stream bank erosion and incision which has destroyed most aquatic habitat. These urban stormwaters are also subjecting the stream to a mix of floatable debris and toxic and nutrient-rich street runoff which is compromising chances of any natural biota surviving in the little stable habitat which exists. This polluted, sediment and nutrient laden runoff ultimately impacts the main stem of the Anacostia River as well.

The District Government, the Federal Government and regional watershed organizations have been working to develop a feasible plan to address the problems of Hickey Run. In 1991 the Metropolitan Washington Council of Governments (COG) produced the comprehensive Hickey Run Subwatershed Action Plan. This plan outlined the current status of the stream and it's watershed as well as proposing various solutions to the problems identified by the plan. The USNA itself commissioned a private study; Storm Water Management Conceptual Design for Hickey Run Sub-Watershed. Both of these reports developed solutions which addressed the dual problems of water quantity and quality and recommended significant habitat modifications to the stream. In November 2001, the Center for Watershed Protection submitted the final deliverable to the National Arboretum, EHA, and the EPA entitled "Innovative Stormwater Treatment in Hickey Run and the National Arboretum". This report recommended installation of a trash trap and oil/grease separator to treat the first quarter inch of a rainfall event at a cost of ~$595,000. Most recently (October 2004), The US Fish and Wildlife Service completed a comprehensive Level IV watershed and stream assessment report describing, in detail,

the fluvial geomorphology of Hickey Run in preparation for a comprehensive stream rehabilitation using natural channel design to be done at the earliest convenience of the USNA.

As of the March of 2004, a Memorandum of Understanding (MOU) has been agreed upon and signed by all stakeholders to research and build a trash trap and oil/grease separator to treat the first half inch of any rain event. They include the National Arboretum, EPA, DCWASA and EHA. $2,188,950 was appropriated specifically for this purpose by Congress; $1.7M provided in the Conference Report to the FY2003 Consolidated Appropriations Act for the Hickey Run pollution abatement activities at the USNA (Conf. Rep. No. 10, 108th Cong., 1st Sess. 559 (2003) and $500,000 provided in the Conference Report to the FY2001 Appropriations Act to the District of Columbia. DCWASA and the Arboretum are currently creating a maintenance agreement for the proposed BMP.

The primary contractor for the USDA, EarthTech Inc., has is preparing a list of potential BMP options for the primary outfall into Hickey Run. A subcontractor to EarthTech, Ecologix Inc., is engaging all stakeholders. Permitting and construction of the BMP of choice is expected in late 2006, early 2007.

The restoration of the stream banks and channel to reduce erosion, create stable benthic habitat and increase biological diversity are considered to be of equal importance as the installation of the proposed BMPs. All efforts to improve water quality and stream bank stability of Hickey Run will ultimately benefit the Anacostia River as well.

Implementation Strategy/Recommendations/Actions

The following recommendations for restoration of the Hickey Run Watershed should be taken into consideration.

Action 1: Reduce non-point source pollution generated in the upper urban watershed and reduce peak flow of concentration during storm events of half an inch or less. This would primarily involve comprehensive and systematic use of strategically placed LID BMP retrofits to treat stormwater quality and to a lesser extent, stormwater quantity. Potential reductions of TN (76.6 lbs/yr) and TSS (5.9 tons/year) are significant at a cost of $1.94 million for design, construction and permitting.

Action 2: Installation of trash rack and oil/grease separator on USNA property at NY Avenue outfall in order to intercept floatable trash and debris and the majority of PAHs flowing into the Arboretum for all half inch to one inch rain events. Expected abatement is not yet known as a specific technology has not been chosen at this time in the project cycle. Although note that NY Avenue outfall passes 83% of all stormwater by volume, or 63% of the total watershed, by area. We do know that total PAH loading estimated at

88.8 pounds per year in 1998 at the NY Avenue outfall. Reduction of 70-80% of floatable oil and grease will be possible with the new BMP.

Action 3: WASA is slated to repair the sanitary sewer at two problem sites where it crosses Hickey Run to avoid further direct contamination of the river by sewage leaks. According to WASA, plans have been drawn up to do such repairs and are planned for 2006. We expect an 86% reduction in MPN/100mL as a result of this infrastructure upgrade.

Action 4: Rehabilitate 3 high priority tributaries. 100% design plans for 3 tributaries to Hickey Run (all on USNA property) and 30% design plans for the mainstem will be complete later in 2005. Potential pollution abatement of TN and TSS could be significant, at 243 lbs year and a very conservative 15.4 tons per year respectively. Note: If USNA does not allow stream rehabilitation, we have the option of working with USFWS to create a wetland where Hickey Run meets the Anacostia. Placement of a wetland would serve to treat water quality before it enters the Anacostia River.

Action 5: Work with ICPRB via their grant from MWCOG to initiate comprehensive community education and outreach on current pollution abatement efforts planned on USNa property. Community should be educated about implications of excessive fertilizer use for lawn care, as well as the implications of improper garbage disposal. Annual trash surveys (as noted above) have not demonstrated a clear annual trend in floatables concentrations in the mainstem of Hickey Run between 1998 and 2003. DOH Water Quality Division has historically done outreach and education to automotive repair facilities in order to reduce illegal dumping of automotive liquids (oil, coolant etc). This needs to be repeated. Coordination with ICPRB will be sought on this endeavor.

Action 6: Rehabilitation of Hickey Run mainstem and remaining 3 tributaries using natural channel design in order to create a stable stream channel and stream bed with the necessary habitat diversity (pools and riffles) to support wildlife. Estimated cost $3,289,988. Effect on TSS could be as much as 1-2 million pounds per year (500 – 1000 tons) if all 2.3 miles of stream were restored. Note: If USNA does not allow stream rehabilitation, we have the option of working with USFWS to create a wetland where Hickey Run meets the Anacostia. Placement of a wetland would serve to treat water quality before it enters the Anacostia River.

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1. Description of Hickey Run

Hickey Run is a western tributary of the Anacostia River which flows approximately 0.9 miles southeast to the Anacostia. The total watershed area is roughly 1,079 acres or 1.7 square miles. The northern half of Hickey Run's watershed lies in a heavily industrialized and mostly impervious area above New York Avenue. The northern half of the stream is essentially a sewershed, as it is completely piped. The southern half of the stream is fed by this complex storm sewer system. The southern half of the stream, the day-lighted half, traverses the USDA National Arboretum and is its dominant drainage feature. Due to the heavily developed and mostly impervious northern half of the watershed, high peak flows with short times of concentration for even relatively minor rain events are the norm. As a result Hickey Run is heavily degraded, as are most of the streams in the highly urban Anacostia River watershed.

The aerial photograph below shows New York Avenue which separates the northern boundary of the National Arboretum and the upper highly impervious watershed. Hickey Run empties into the Anacostia River.

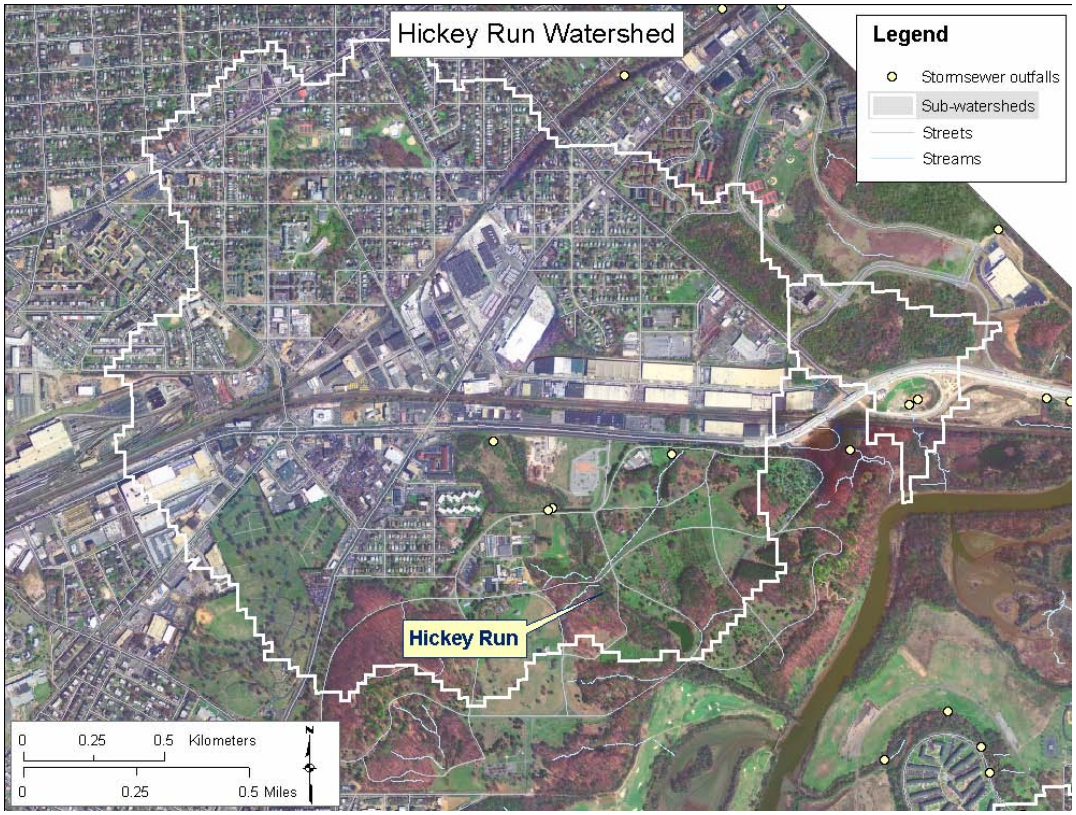

Figure 1: Aerial Photograph of Hickey Run Watershed, Washington DC.

1.1 Geology and Soil Conditions

Geologically, almost the entire watershed belongs to the Upper Cretaceous Patapsco Formation and Arundel Clay. Hickey Run is also what would be considered a coastal plain stream. The dominant soil association is the Urban land-Christiana-Sunnyside association. These soils are deep, nearly level to steep, well drained soils that are underlain by unstable clayey sediment and predominantly found on upland areas.

1.2 Flow Characteristics

Hickey Run is a perennial, low gradient, warm water stream. The stream width varies from approximately 20 feet at its widest to approximately 5 feet at its narrowest. The stream gradient was measured at 1% from the USGS Quadrangle and also truthed by clinometer at various ground sites. Flows can fluctuate wildly with storm events with significant flows from the highly impervious headwaters, as can be seen in the table below.

Table 1: Hickey Run Flows Using the Unit Hydrograph Methodology.

Rainfall Depth (inches)	Approximate % of All Storm Events (equal to or less than this rainfall)	Flow (cfs)
0.5	56	136
0.4	50	109
0.25	30	68

Table 2: Hickey Run Flows Using TR-55

Return Interval (years)	Flow (cfs) – Jewell Engineering	Flow (cfs) – CWP*
2	608	561
5	953	1,066
10	1,127	1,527
25	1,529	1,708
50	1,809	2,030
100	2,028	2,500

*CWP = Center for Watershed Protection.

1.3 Stream Reaches

Hickey Run can be separated into six reaches based on stream characteristics and stability conditions observed by the US Fish and Wildlife Service. There are five project reaches located on the main-stem of Hickey Run, which is approximately 5,000 linear feet (See Figure Six Reaches of Hickey Run Mainstem, Washington DC). The first reach (HR-1),

starting at the farthest upstream reach of Hickey Run, is a heavily armored reach, approximately 1,170 linear feet. The second reach (HR-2) is a concrete lined channel, approximately 480 linear feet. The third and forth reaches (HR-3 and 4) are natural streams that are under adjustment and are 950 linear feet and 1,150 linear feet, respectively. The fifth reach (HR-5) is tidally influenced and drains into the Anacostia River, approximately 1,150 linear feet. The sixth reach (HR-6) is a tributary to Hickey Run, approximately 1,870 linear feet.

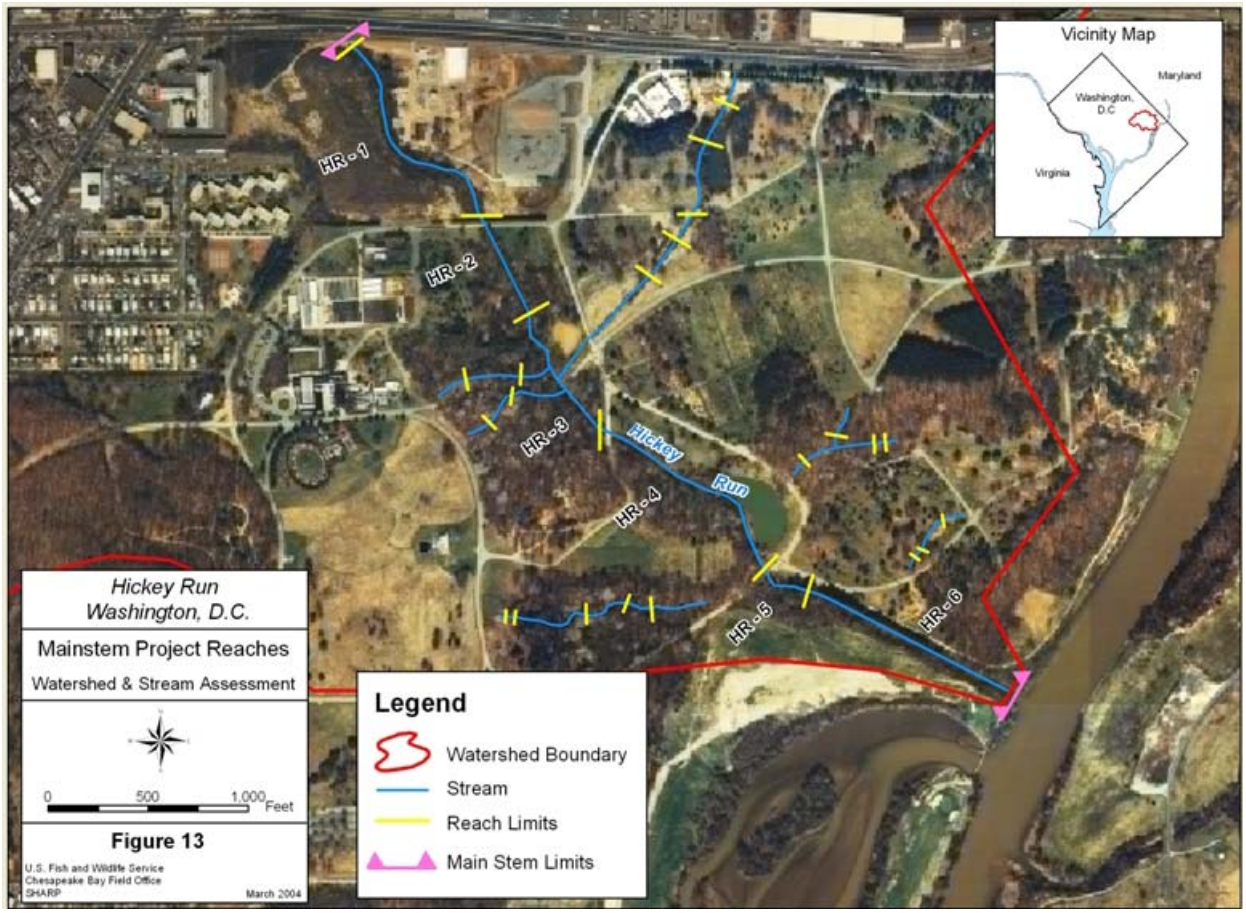

Figure 2: Six Reaches of Hickey Run Mainstem, Washington DC.

The tributaries to Hickey Run, broken down by reach by the US Fish and Wildlife Service can be seen in the Figure below.

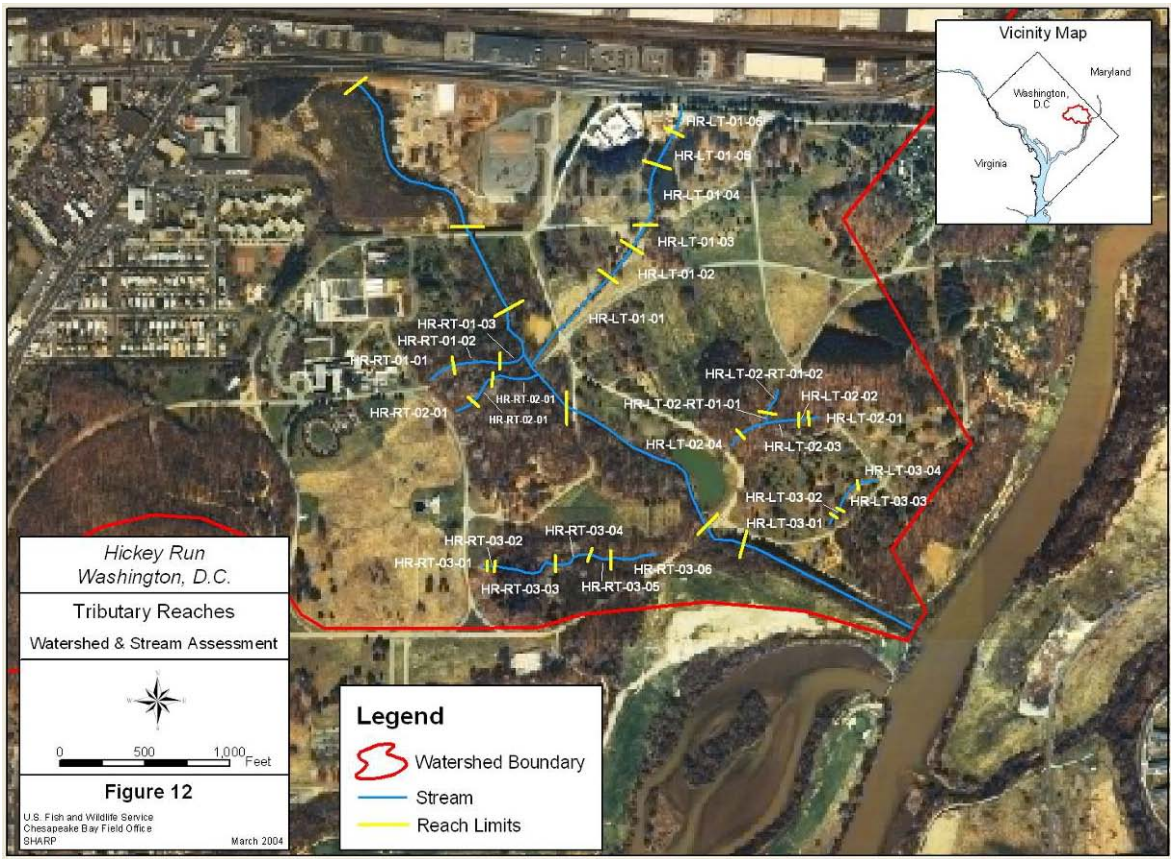

Figure 3: Six Tributaries to mainstem of Hickey Run, Washington DC, labeled by reach.

1.4 Land Usage and Habitat Conditions

Land use throughout the Hickey Run watershed is highly variable. While ~20% of the watershed is forested or parkland (mostly USNA property), ~80% is developed for residential, commercial and industrial use. Of the approximately 1.7 square mile watershed, 235.2 acres drain the grounds of the Arboretum while 836.2 acres constitute the mostly impervious upper watershed.

The National Arboretum is approximately 86.5% undeveloped consisting of natural and cultivated vegetation, vegetative buffers and water features. Approximately 13.5% of the Arboretum is impervious consisting of buildings, roads, and parking areas. In contrast to the Arboretum, the upper watershed is characterized by average imperviousness of up to 75% or greater.

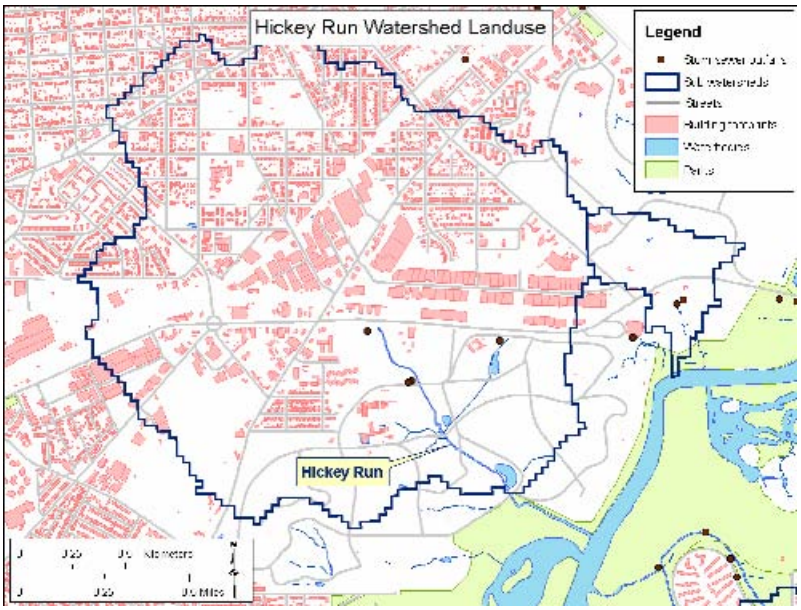

Figure 4: Land-use map of Hickey Run watershed, Washington DC.

While the Arboretum clearly maintains a near ideal terrestrial habitat condition for an urban stream, the impervious nature of the headwaters and the resultant flashy stormwater flows have scoured out the widened stream channel and eroded its banks. What's more, this area of Hickey Run has been altered by channel straightening, installation of concrete-lined channels, and/or channel relocation. The stream bottom is characterized by brick fragments from the former brickyard upstream and the high banks are stabilized in some areas by riprap. The floodplain on both sides of the stream is reported to have been filled with spoils from the construction of the Metro system and therefore the stream has limited access to its historic floodplain. Although in some locations of the National Arboretum, a decent buffer exists.

Lastly, numerous road crossings in the Arboretum have created effective fish blockages to anadromous and resident fishes from the Anacostia River.

1.5 Sewered Areas (Sewershed) and Sampling Locations

As a requirement of the District of Columbia's MS4 (Municipal Separate Storm Sewer) Permit, explained in detail below, characterization of the separate storm sewer area is to be performed and sewer maps of the system are to be developed. In fact the entire watershed north of New York Avenue is a sewershed, as can be seen by Figure 4-1 below.

The portion of the Hickey Run watershed which is drained by storm sewers (843.8 of 1,079 acres which drains to the Anacostia River or ~82.6% by area) can be divided into four subwatersheds with the following outfalls:

- **New York Avenue Outfall** – Approximately 697 acres drain through storm sewers to the box culverts (twin 8 feet × 11 feet) outfall just downstream of New York Avenue. Land use includes commercial, residential, and open space.
- **48-inch Pipe Outfall at Hickey Lane** – A rectangular area of 7.5 acres north of and including New York Avenue and a commercial area drain through storm sewers to a 48-inch pipe at the roadway which discharges at Hickey Lane.
- **48-inch Pipe Outfall at Hickey Lane** – A 48.8-acre area of low density residential and Arboretum property east of Bladensburg Road on both sides of Hickey Lane is drained by a 48-inch pipe which flows east to discharge to Hickey Run at Hickey Lane.
- **84-inch Pipe Outfall at New York Avenue** – Flows from about 90.4 acres of commercial and residential areas generally between 30th Street and South Dakota Avenue discharge into Springhouse Run just downstream of New York Avenue.

The area tributary to the New York Avenue outfall is 64.6% of the total Hickey Run watershed and is 82.6% of the watershed area drained by storm sewers.

Table 3: Summary of Hickey Run Watershed and Sewershed Areas, Hickey Run, Washington DC.

Subwatershed Description	Area (acres)	% of total watershed	% of total sewershed
Hickey Run Watershed	1,079	100	N/A
Area drained by storm sewers (excludes USNA)	843.8	78	100
Area of storm sewers that drains through New York Avenue outfall (proposed BMP location)	697.1	65	83
Area of storm sewers that drains through Hickey Run tributaries or is piped to Hickey Run downstream of the New York Avenue outfall	146.7	14	17
Area drained by surface flows	235.2	22	0

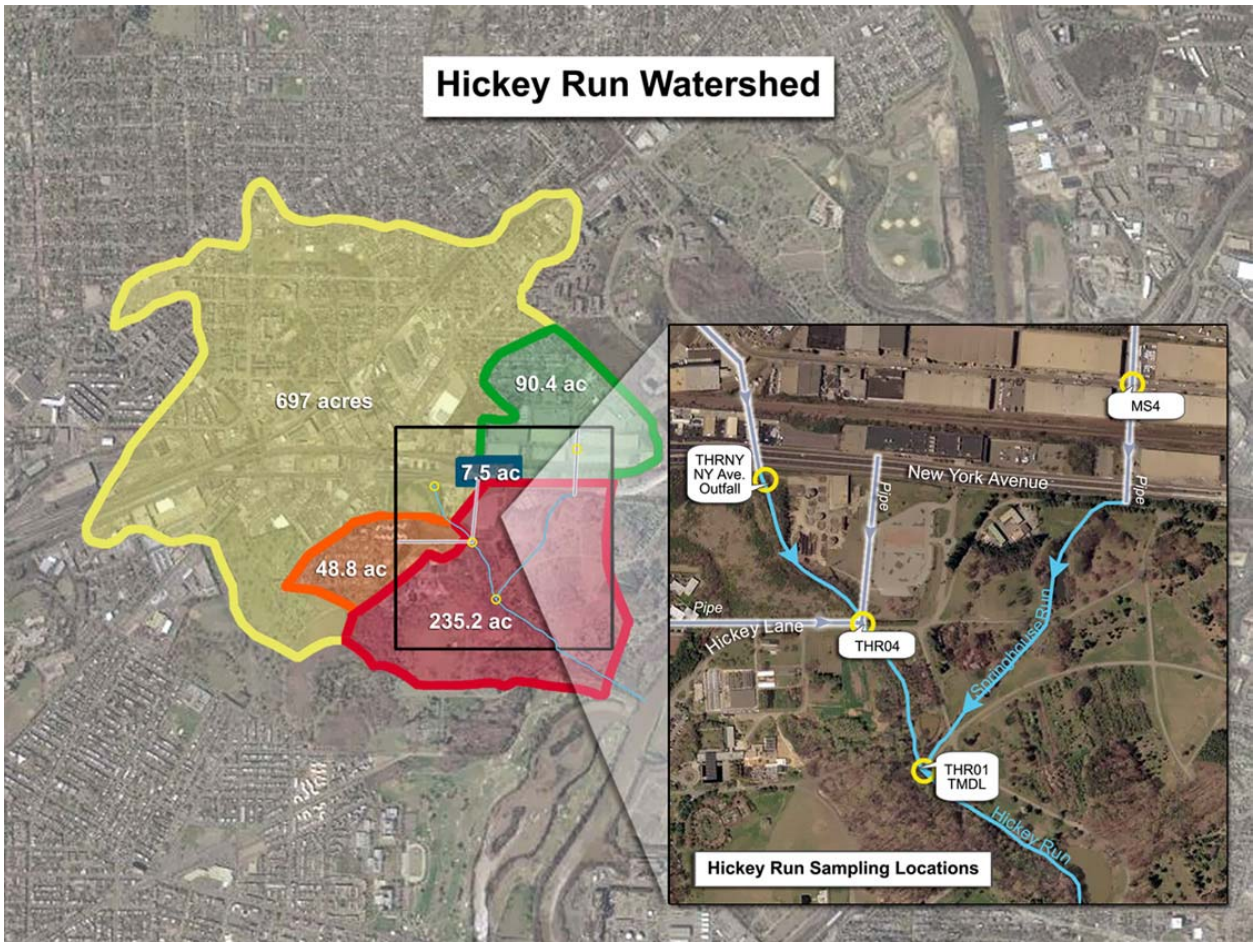

Figure 5: Hickey Run Sub-Sewersheds/Watershed and Sampling Locations, Washington DC.

2. Water Quantity and Quality

2.1 Quantity

Significant hydrologic modification to the upper watershed has been the driving factor in the degradation of the Hickey Run stream channel. The entire watershed above New York Avenue is impervious and all stormwater runoff is captured and conveyed in a network of stormwater pipes, as can be seen in Figure: Hickey Run Watershed and Sampling Locations, below. Runoff travel times are therefore significantly reduced by the efficient pipe network and peak flows arrive faster that normal (decreased "time of concentration"), resulting in "flashy" responses to rainfall events. These high peak flows have destabilized the natural stream channel and are causing severe stream bank erosion and incision which has destroyed most aquatic habitat. What's more, with little or no stormwater infiltration in the upper watersheds after precipitation events, the aquifer(s) is

not being replenished and therefore base flows in the stream channel are compromised or non-existent during drought periods.

2.2 Quality

Overview

Water quality information for Hickey Run has been collected for decades and is available in a variety of forms. Recently, sampling has been performed in various parts of the Hickey Run watershed to satisfy MS4 and TMDL permitting requirements, as explained in detail below.

The water quality of Hickey Run has been severely degraded by pollution from the highly developed and mostly impervious watershed above New York Avenue. Primary sources of this pollution have historically been thought to originate from the DC Metrobus facility and the CSX rail yard in the upper northwestern sector of the watershed. In addition, the watershed contains numerous private automotive support and maintenance facilities, various large automobile and construction waste recyclers and other light industry which is also most certainly contributing to water quality impairment. Petroleum based products and other automotive fluids, heavy metals, pathogens and nutrients in storm water runoff have compromised water quality of Hickey Run. Floatable trash and debris are also significant contributors to the aesthetic degradation of the stream. Sediment loss from the stream channel and the banks of Hickey Run and its tributaries (all contained within the USNA) has been estimated at 1100 tons per year, by the USFWS in the 2004 Hickey Watershed and Stream assessment report. Validation of this estimation through the use of monumented cross-sections data will be available in August of 2005.

What's more, there is a large sanitary sewer/interceptor crossing Hickey Run and the Arboretum which is leaking and keeping the stream from meeting standards for *Fecal coliforms*. It is the Water and Sewer Authority's intention to replace this pipe in the near 2006/2007. Design plans for replacement have already been created and must go through the formal approval process before construction can begin.

Note that evaluation of Hickey Run's swimmable and secondary contact uses are based on surface *Fecal coliform* data collected and compiled over five years as reported in the District's 2002 305(b) report. Hickey was not in compliance for its swimmable use 80.6% of the time and was not in compliance for its secondary contact use 50% of the time for the period 1997-2001. As a result, Hickey run did not support either its swimmable or secondary contact recreational uses from 1997-2001.

As noted in the USNA's Master Plan, the water quality and sediment of Hickey Run have been severely degraded by pollution from the watershed above New York Avenue. Contaminants are primarily fuels, oils, and greases (petroleum and hydrocarbons).

Pollutants other than petroleum may be present as well. During the Site Investigation in 2000, a sediment sample (Sample # USNA-BG-SW/SED1) was collected where Hickey Run flows into the Arboretum under New York Avenue. The sample was analyzed for heavy metals, pesticides, polychlorinated biphenyls (PCBs), and semivolatile organic compounds (SVOCs), but not for total petroleum hydrocarbons (TPH). Lead and numerous SVOC concentrations (including fluorine and phenanthrene) were above sediment quality guidelines for metals in freshwater ecosystems. In addition, as described in the 1991 Hickey Run Subwatershed Action Plan, Hickey Run historically does not meet the District's secondary contact standards for fecal coliforms.

2.3 Water Quality Sampling Programs

Note that monitoring water quality is required for the Total Maximum Daily Loads (TMDL) and MS4 programs, as described in detail below. Sampling is performed at the locations described in Table Hickey Run Sampling Locations and on Figure Hickey Run Sub-Sewersheds/Watershed and Sampling Locations above.

Table 4: Hickey Run Sampling Locations, Washington DC.

Identification	Location	Drainage Area	Data Available	Comments
MS4	V Street and 33rd	About 60 acres upstream of V Street	Testing of wet-weather samples for all constituents – 3 events in 2001 and 2002	Site for sampling for MS4 Permit compliance
THRNY	Hickey Run downstream of New York Avenue culvert	697 acres upstream of New York Avenue	Qualitative trash data	Site of proposed BMP
THR01	Hickey Run 150 feet upstream of Meadow Lane	About 1000 acres (all sewered areas and 65 acres of Arboretum)	Ambient monitoring results for all constituents 1999 to 2002	Site for sampling for TMDL compliance
THR04	Hickey Run at Hickey Lane	About 890 acres (all sewered areas and 45 acres of Arboretum	none	Noted in DCDOH sampling points list

Results show that water quality at the sampling locations generally meet the established water quality standards, except for one exceedance at MS4 for oil and grease, in 2001.

2.4 Water Quality Data Collection and Reporting

(From EarthTech Document Review Summary)

2.4.1 District of Columbia Bi-Annual Report to USEPA and Congress

The Water Resources Management Division of the District of Columbia Department of Consumer and Regulatory Affairs (DCDCRA), Environmental Regulation Administration, prepares a report every other year as required under Section 305(b) of the *Federal Clean Water Act* (P.L. 97-117). Each report summarizes water quality information for District's surface and groundwater and provides updates of the District's efforts in their water pollution control program. The reports provide summaries of the pollution history of Hickey Run and the efforts made to control pollution upstream in the watershed. The most recent report (2002) mentions the proposed installation of a stormwater management facility to control oil and grease.

Each report contains an assessment of each water body and whether or not it is supporting its designated use. In 1996, the entire 0.9 miles of Hickey Run did not support the intended use for fish consumption, overall use support, aquatic life support, swimming, and secondary contact recreation. Non-attainment was attributed to presence of metals, improper pH, pathogens, and oil and grease. The 1996 report also reports the daily "stench of oil, gasoline, and other petroleum hydrocarbons" along with oil sheens along quiescent stretches. By 2000, the aquatic life support designated use had improved to "partial support" (an improvement from "not supported") and the qualitative reporting of oil and grease was no longer present. However, organic enrichment and low dissolved oxygen had been added to the causes of non-attainment. A similar assessment was provided in 2002.

2.4.2 Interpretive Summary of Existing Data Relevant to Potential Contaminants of Concern within the Anacostia River Watershed

This 2000 report was prepared by Syracuse Research Corporation (SRC) under a contract from GEOCENTERS, Inc (GC-3381-99-002) for the Anacostia Watershed Toxics Alliance. The report was developed in collaboration with the National Oceanic and Atmospheric Administration (NOAA) and O'Brien and Gere Engineers, Inc. Contributions made by NOAA included assembling all of the environmental monitoring data into the Anacostia River Watershed Database and Mapping Project. Contributions made by O'Brien and Gere Engineers included the evaluation of information on river hydrodynamics and sediment transport. Important contributions were also made by U.S. EPA Region 3, which provided access to many of the background reports and documents that were reviewed, and by the Anacostia Watershed Toxics Alliance, whose members provided comments and suggestions on an earlier draft of the report (March 2000).

This report is a summary of the results of Phase I of an assessment of chemical hazards and characterization of related human risk and ecological receptors for the Anacostia watershed. The results pertain to the watershed as a whole and data specific to Hickey Run is not provided. However, the contributing pollution problems associated with Hickey Run are documented, including contributions of petroleum hydrocarbons. There is mention of Hickey Run's rating as a high priority water body in need of accelerated

restoration. The report can be found at: http://www.chesapeakebay.net/awta/guide/home/AnacDrFNjn00.pdf.

2.4.3 Spring 2003 MWCOG Anacostia Tributary System Trash Survey

This document provides a summary of the MWCOG 2003 survey of trash conditions in 44 tributary segments of the Anacostia River. In the 1,550 feet downstream from the New York Avenue outfall, 2,161 items were documented, for an average of 139 items per 100 feet. This compares to annual surveys of 157, 270, 322, 192, and 233 per 100 feet in 1998 through 2002, showing no appreciable pattern in findings. The major items observed in 2003 were plastic bags, plastic bottles, and Styrofoam cups. There is no reference to any type of biohazardous materials found in any of the tributaries.

2.5 Biologic Integrity: Quantifying Biota, the Banta Report

A 1993 document entitled *"The Banta Report, Biological Water Quality of the Surface Tributary Streams of the District of Columbia,"* by William C. Banta at The American University in Washington, DC characterizes the watersheds for the District of Columbia surface waters and provides some limited quantification of each watershed. Over two dozen locations were sampled. The purpose of the report was to characterize and quantify biota within these streams. The study point for Hickey Run is THR02, the confluence of Hickey Run and the Anacostia River. Results include quantification of taxa at the study point. This study also provides a scaled quantification of the river habitat. Hickey Run was given a bioassessment score of 45%, or "moderately impaired." However, the report notes that the sampling was performed where there was tidal influence, potentially providing erroneous data. The report recommends resampling before drawing conclusions from the data.

The evaluation of Hickey Run aquatic life support use is based on a Level II U.S. EPA Rapid Bioassessment conducted in 1997 and reported in the 1998 water quality report to the EPA and Congress. Hickey Run was found to be partially supporting its aquatic life use designation. A bioassessment score of 41% and a habitat assessment score of 69% for its reference stream was determined. Fish surveys conducted revealed pollution tolerant species in the lower reaches with some abundant river species congregating behind the fish blockage at a road crossing in the Arboretum. Terrestrial wildlife in the Arboretum can be considered as diverse and abundant as anywhere in the city.

3. Background on District Pollution Discharge

(From EarthTech Permit Identification Summary Report)

3.1 National Pollution Discharge Elimination system (NPDES)

Overview

The 1972 Federal Water Pollution Control Act (FWPCA) amendments, also referred to as the Clean Water Act (CWA), prohibit the discharge of any pollutant into waters of the United States from a point source unless the discharge is authorized by a NPDES permit. Efforts to improve water quality under the NPDES program have traditionally focused on reducing pollutants in discharges of industrial process wastewater and from municipal sewage treatment plants. In response to the need for comprehensive NPDES requirements for discharges of stormwater, Congress amended the CWA in 1987 to require the USEPA to establish phased NPDES requirements for stormwater discharges. In addition to stormwater discharges associated with certain industrial activities, these regulations apply to discharges from municipal separate storm sewer systems located in cities with a population of 100,000 or more.

While NPDES permits are required for stormwater discharges from a range of industrial activities, only two types of activities are pertinent to the Hickey Run Pollution Abatement Project – discharges from municipal separate storm sewer systems located in municipalities with a population of 100,000 or more, and discharges from construction operations disturbing one or more acres (USEPA Office of Water, June 1996; USEPA NPDES Website, November 2004d).

In most states, the USEPA has delegated the management of the stormwater NPDES permit program to state governments. Where the program has not been delegated, the USEPA implements the program through its regions. The District's program is managed by Region III of the USEPA (USEPA NPDES Website, November 2004c).

3.2 Municipal Separate Storm Sewer Permit (MS4)

General

DCWASA is the lead agency responsible for coordinating efforts to achieve compliance with the MS4 Permit issued by USEPA on August 19, 2004 to the government of the District of Columbia. The permit authorizes discharges from the separate storm sewer system into the Potomac River, Anacostia River and tributaries with the development of a stormwater management program. This program includes measures to: identify major outfalls and pollutant loadings; detect and eliminate non-stormwater discharges to the system; reduce pollutants in runoff from industrial, commercial, and residential areas; and control stormwater discharges from new development and redevelopment areas. Included in the permit are effluent limitations, monitoring and reporting requirements, and Best Management Practice (BMP) implementation requirements.

A "municipal separate storm sewer" is any conveyance or system of conveyances, owned or operated by a state or local government entity, designed for collecting and conveying

stormwater and not part of a Publicly Owned Treatment Works. The application requirements for a MS4 Permit do not apply to discharges from combined stormwater/sanitary sewer systems, which have a different NPDES obligation (USEPA, Office of Water, June 1996).

The District government owns and operates a MS4 system that discharges stormwater during wet weather from various outfall locations throughout the District into its waterways. The District government was issued its first MS4 Permit in April 2000. This permit required the District to implement its existing stormwater management plan over the next three years, and during that time review and propose an improved stormwater management plan. MS4 Permits are considered dynamic instruments: they are reviewed periodically and adjusted to reflect changed conditions within the watershed(s) covered (USEPA NPDES Website, November 2004b).

The District has revised its stormwater management plan and the USEPA recently issued the District's revised permit (the revision and background material are presently posted on the USEPA website). The revised permit reflects changes that occurred since the first permit was issued, namely: the passage by the District of the Stormwater Permit Compliance Amendment Act of 2000 in June 2001, which established the regulatory infrastructure needed to enforce a stormwater management plan; the development of a monitoring program to determine the chemical and physical characteristics of the stormwater being discharged through its outfalls; performance of an assessment of current MS4 activities which contribute to the runoff being discharged into the MS4 system; provision of an implementation plan for managing the MS4 activities within the District; and submittal of an upgrade to its current stormwater management plan.

Acting on the District's stormwater management plan, the USEPA established a combination of narrative and best management practice (BMP) effluent limits. The MS4 Permit focuses on controls of the sources of pollutants through the use of BMPs under existing federal rules and regulations. However, USEPA has also identified effluent limits consistent with the total maximum daily loads (TMDLs) waste load allocations (WLAs) (USEPA Website, November 2004b). The MS4 Permit includes an appended table with a list of TMDL WLAs for the various subwatersheds within the District.

3.3 Hickey Run and MS4

In the MS4 Permit, Hickey Run at 33rd and V Streets is listed as a representative monitoring outfall location for water quality data. Note that the stormwater from this location does not flow through the proposed BMP location at New York Avenue. This stormwater flows through a tributary in the Arboretum, Springhouse Run, before meeting the main stem near Meadow Road, downstream of New York Avenue.

The waste load allocations included in the MS4 Permit and as shown on the Fact Sheet for National Pollutant Discharge Elimination System (NPDES) Permit Number DC0000221 are provided in the table below.

Table 5: Hickey Run MS4 TMDL, Washington DC.

Pollutant	Existing Loads (lbs/yr)	Required Reduction	TMDL (lbs/yr)
Chlordane	0.05761	85%	0.008556
DDD	0.03261	90%	0.003197
DDE	0.08707	92%	0.006896
DDT	0.2314	97%	0.006872
Dieldrin	0.03436	80%	0.006872
Heptachlor Epoxide	0.007510	90%	0.0007435
PAH 1	3.922	0%	0.07765
PAH 2	2.372	98%	0.4649
PAH 3	1.502	98%	0.3004

Note that these loads are developed for the areas draining to the storm sewer system, not the entire watershed area. Therefore, these values are less than those presented for the TMDL in the table entitled, Hickey Run Organics TMDL, below. Fecal coliform bacteria and oil and grease are not included in this pollutant list, but are covered in separate, individual TMDLs for Hickey Run.

Part VI of the revised District NPDES permit addresses the oil and grease issue at Hickey Run. The open channel which flows through the USNA in the lower half of the watershed picks up oil and grease from roads, parking lots, and sediments as well as occasional illegal dumping. The TMDL in the April 2000 permit required a Waste Load Allocation (WLA) of 11.9 pounds per day (lbs/day) of oil and grease at a stream flow in Hickey Run of 0.5 cubic feet per second (cfs).

Monitoring by the District at the ambient sampling site (THR01) and at the MS4 sampling site have indicated that this parameter is consistently meeting the water quality standard of 10 milligrams per liter (mg/L) and should no longer be considered a pollutant of concern. The improved conditions are attributed to the use of source controls and effective enforcement actions. The current revised permit thus changes the TMDL to a narrative limit – if monitoring by the District at THR01 shows violations for oil and grease standards (i.e., above the water quality standard criterion of 10 mg/L), the Hickey Run MS4 site and BMP shall be sampled on an annual basis rather than every third year under the current watershed-based monitoring program until monitoring shows remedial actions effective to achieve compliance with the TMDL (USEPA Website, November 2004a).

The permit is also based on the District's continued commitment to install a "structural floatable control" BMP in the lower part of the Hickey Run subwatershed. This BMP is meant to provide further control of oil and grease (USEPA Website November 2004b).

As a permit condition, USEPA wants DCWASA to "…continue to use their best efforts to negotiate an agreement with all parties to construct a multi-purpose BMP for ensuring compliance with the Hickey Run TMDL document to the maximum extent practicable at this location and have it operational and ready for monitoring its effectiveness during the permitting cycle"(USEPA, 2004a). Through the MOU, mentioned in the Executive Summary of this document, the ARS has agreed to meet that requirement for the District government (DCWASA).

Thus, the proposed BMP does not itself require an MS4 Permit, nor does it need to meet specific TMDL WLAs. It is essentially itself a TMDL, or special condition of both the original and recently issued revised MS4 Permit. USEPA reissued the District's MS4 Permit with the understanding that DCWASA will do everything possible to construct (or ensure construction of) the BMP. To the extent practicable, however, the construction firm contracted to design and build the BMP of choice (Earth Tech Inc.) will address other TMDL WLAs in the BMP design.

The TMDL WLAs for Hickey Run are listed in Table District MS4 WLAs for Hickey Run, Washington DC. TPCB (Total polychlorinated biphenyl) WLAs are not provided for Hickey Run.

Table 6: District MS4 WLAs for Hickey Run, Washington DC.

Pollutant	Existing MS4 Load	TMDL MS4 WLA	Units	Required Reduction
Chlordane	5.761E-02	8.556E-03	lbs for 3 yrs	85%
DDD	3.261E-02	3.197E-03	lbs for 3 yrs	90%
DDE	8.707E-02	6.896E-03	lbs for 3 yrs	92%
DDT	2.314E-01	6.872E-03	lbs for 3 yrs	97%
Dieldrin	3.436E-02	6.872E-03	lbs for 3 yrs	80%
Heptachlor epoxide	7.510E-03	7.435E-04	lbs for 3 yrs	90%
PAH1	3.922E+00	7.765E-02	lbs for 3 yrs	0%
PAH2	2.372E+01	4.649E-01	lbs for 3 yrs	98%
PAH3	1.502E+01	3.004E-01	lbs for 3 yrs	98%
TPCB				

Source: USEPA Website, November 4, 2004a

3.4 Hickey Run's TMDLs

(From EarthTech Document Review Summary)

Overview

Hickey Run is a water body in the District of Columbia and as such is regulated by the water quality standards identified in the District of Columbia Municipal Regulations (DCMR) in addition to the standards of the USEPA. The District identifies specific water quality standards in DCMR Title 21, Chapter 11. Hickey Run is permitted through the

USEPA via the MS4 Permit and TMDL program. In order to meet these regulations, several legal agreements have been prepared and signed between various agencies that have jurisdiction over various aspects of water quality for Hickey Run for the design, permitting and construction of a BMP at THRNY.

3.5 District of Columbia Municipal Regulations

DCMR, Title 21, Chapter 11 establishes the water quality standards for surface waters of the District of Columbia based on categories of uses, defined in the table below.

Table 7: Category of Uses that Determine Water Quality Standards.

Class	Category
A	Primary contact recreation
B	Secondary contact recreation and aesthetic enjoyment
C	Protection of propagation of fish, shellfish, and wildlife
D	Protection of human health related to consumption of fish and shellfish
E	Navigation

The water quality standards have been approved by the USEPA in accordance with Section 303c of the Clean Water Act (CWA) and 40 Code of Federal Regulations (CFR) Part 131. Both qualitative and quantitative criteria are presented.

Hickey Run is designated as a surface water with current and future beneficial use classes of B, C, and D. When waters are designated with multiple classes, the most stringent standard governs. DCMR Title 21, 1104.7, Tables 1 through 3 defines the most stringent numeric water quality criteria that are needed to meet and attain the designated uses for Hickey Run via a comprehensive list of physical, trace metals, inorganic, and organic constituents. Included in this list is a limit of 10 milligrams per liter (mg/L) for oil and grease for Class C waters.

Title 21, 1104-1 provides six qualitative standards for surface water, stating that they shall be free from substances which:

- Settle to form objectionable deposits
- Float as debris, scum, oil
- Produce objectionable odor, color, taste of turbidity
- Adversely affect humans, plants or animals
- Result in dominance of nuisance aquatic species or
- Impair the biological community.
- Section 303(d) List

The CWA requires all states to submit a list of impaired waters for USEPA approval every two years (even-numbered years). The 303(d) list identifies all waters where

applicable water quality standards are not met. From the 303(d) list, states must: identify the waters that require TMDLs; rank those waters taking into consideration the water uses and severity of the pollution problem; identify the pollutants involved; and identify the waters targeted for TMDL development in the next two years.

The District of Columbia submitted the initial list in 1996. The currently approved 303(d) list was developed in 2002 and included oil and grease, organics, and bacteria as impairments in Hickey Run.

3.6 Total Maximum Daily Loads (TMDL)

TMDLs have been established to set the quantity of a pollutant which can be introduced into Hickey Run without exceeding the applicable water quality standard established by the USEPA via the CWA. The TMDLs for Hickey Run are the result of a process that involved development of the water quality standard and establishment of the TMDL by the DCDOH with approval from USEPA. The Section 303(d) list of impaired waters is used as the basis for selection of water bodies for which TMDLs must be developed.

For Hickey Run, TMDLs have been established for oil and grease, fecal coliform, and organics. TMDLs for biochemical oxygen demand and total suspended solids are being developed for the Anacostia River, but specific load allocations have not been established for Hickey Run.

3.6.1 Oil and Grease TMDL

DCDOH prepared the "*District of Columbia Final Total Maximum Daily Load for Oil and Grease in Anacostia River*" document in October 2003. This document reiterates the process for developing TMDLs for oil and grease, the applicable water quality standards, a description of the watershed, an assessment of point and non-point sources, the TMDL allocations, and the technical approach to meeting the TMDL requirements.

Since little data for existing loadings and sources is available, the TMDL was developed using the stream's assimilative capacity (stream flows multiplied by 10 mg/L District's water quality criteria). Total oil and grease loads of 1,035.3 pounds per day (lbs/day) are presented for the Upper Anacostia, Lower Anacostia, and Upstream (Maryland) water bodies.

A TMDL for oil and grease was set for the Anacostia River because oil from Hickey Run historically entered the river and caused exceedance of the criteria of 10 mg/L for oil and grease for Class C waters. Spills and illicit discharges of oil and grease are identified as major sources of pollution. Source control activities include development of a database for auto service facilities, education of stakeholders, and inspection and enforcement of facilities with potential for point source violations.

Information used to develop the oil and grease TMDL is presented in several documents. DCDOH prepared the *"Hickey Run TMDL to Control Oil and Grease"* in September 1998. This document provides a description of Hickey Run, the development of the TMDL allocation, and a strategy for meeting the TMDL requirement. Background information provided in this document states that "petroleum hydrocarbon spills and dumping episodes have plagued the stream for decades."

Oil and grease sources and loads to Hickey Run were developed as summarized in Table Hickey Run Oil and Grease Sources, below.

The allowable oil and grease load of 27.0 lbs/day is calculated using an assumed streamflow of 0.5 cfs and the numerical criteria of 10 mg/L and is comprised of a waste load allocation of 11.9 lbs/day, a load allocation of 8.4 lbs/day, and a margin of safety of 6.7 lbs/day. The resulting TMDL is summarized in Table entitled, Hickey Run Oil and Grease TMDL, below.

Table 8: Hickey Run Oil and Grease Sources, Washington, DC.

Source Category	Source	Existing 1998 Load (lbs/day)	Comments
Point	Outfall #1*	88.8	Based on estimated oil and grease volume captured by containment boom
Non-point	Sediment & groundwater	8.1	Calculated as product of baseflow discharge (assumed to be 0.5 cfs) and pollutant concentration (2 mg/L)
Non-point	Direct Runoff	3.8	Calculated using DCDOH Simple Method with 15% imperviousness for 378.4 acres not tributary to storm sewers
Total	All	119.3	Sum of all loads – results in instream concentration of 44.2 mg/L for baseflow conditions

*Outfall #1 is the NY Avenue outfall.

Table 9: Hickey Run Oil and Grease TMDL, Washington DC.

Pollutant	Existing Load 1998 (lbs/yr)	Numerical Criteria	TMDL (lbs/yr)
Oil and Grease	88.8	10 mg/L	27.0

The USEPA issued the "Decision Rationale Total Maximum Daily Loads, Anacostia River Watershed and Kingman Lake for Oil and Grease" in October 2003. The issuance of this document approves the TMDLs developed by the DCDOH in the "Final Total Maximum Daily Load for Oil and Grease in the Anacostia River" document described above.

3.6.2 Fecal Coliform Bacteria TMDL

DCDOH prepared the *"Final Total Maximum Daily Load for Fecal Coliform Bacteria in Upper Anacostia River, Lower Anacostia River, Watts Branch, Fort Dupont, Fort Chaplin Tributary, Fort Davis Tributary, Fort Stanton Tributary, Hickey Run, Nash Run, Popes Branch, Texas Avenue Tributary"* document in June 2003. This document reiterates the process for developing TMDLs for fecal coliform bacteria, the applicable water quality standards, a description of the watershed, an assessment of point and non-point sources, the TMDL allocations, and the technical approach to meeting the TMDL requirements.

Hickey Run, as a Class B water body, must achieve the water quality standard for bacteria, measured as fecal coliform. The standard is a 30-day geometric mean of 1,000 most probable number (MPN)/100 milliliter (mL).

Data presented about Hickey Run in the DCDOH document are summarized in Table entitled, Hickey Run Fecal Coliform Bacteria TMDL – DOH Report.

In this document, the proposed stormwater pollution abatement project on Hickey Run at the National Arboretum is described as providing bacteria reduction benefits.

The USEPA issued the *"Decision Rationale Total Maximum Daily Loads, Anacostia River Watershed for Fecal Coliform Bacteria"* in October 2003. The issuance of this document approves the TMDLs developed by the DCDOH in the document described at the beginning of this section although slightly more stringent reductions are reported. The TMDL summary is summarized in the table entitled Hickey Run Fecal Coliform Bacteria TMDL, below.

Table 10: Hickey Run Fecal Coliform Bacteria TMDL – DCDOH Report, Washington DC.

Pollutant	Existing Load 2003 (MPN)	Required Reduction	TMDL (MPN)
Fecal Coliform Bacteria	1.79×10^{08}	86%	2.51×10^{07}

Table 11: Hickey Run Fecal Coliform Bacteria TMDL – USEPA Report, Washington DC.

Pollutant	Existing Load 2003 (MPN)	Required Reduction	TMDL (MPN)
Fecal Coliform Bacteria	1.79 x 10^{08}	90%	1.79 x 10^{07}

3.6.3 Organics TMDL

DCDOH prepared the *"Final Total Maximum Daily Load for Organics and Metals in Anacostia River, Fort Chaplin Tributary, Fort Davis Tributary, Fort Dupont Creek, Fort Stanton Tributary, Hickey Run, Nash Run, Popes Branch, Texas Avenue Tributary and*

Watts Branch" document in August 2003. This document reiterates the process for developing TMDLs for organics and metals, the applicable water quality standards, a description of the watershed, an assessment of point and non-point sources, the TMDL allocations, and the technical approach to meeting the TMDL requirements.

For Hickey Run, TMDLs have been established for organics. Metals are not included because there is no impairments due to metals as defined on the 303(d) list. An analysis of the water body was performed to predict concentrations for organics. Stream flow parameters used include a drainage area of 2 square miles, an average width of 100 feet, and an estimated flow of 8 cfs.

The USEPA issued the *"Decision Rationale Total Maximum Daily Loads, Anacostia River Watershed for Organics and Metals"* in October 2003. The issuance of this document approves the TMDLs developed by the DCDOH in the document described at the beginning of this section. The TMDL summary includes the following approved TMDL provided in the table entitled, Hickey Run Organics TMDL.

Table 12: Hickey Run Organics TMDL, Washington DC.

Pollutant	Existing Loads 2003 (lbs/yr)	Required Reduction	TMDL (lbs/yr)
Chlordane	0.0959	85%	0.0144
DDD	0.054	90%	0.05427
DDE	0.145	92%	0.0116
DDT	0.38500	97%	0.01155
Dieldrin	0.0064	80%	0.00127
Heptachlor Epoxide	0.013	90%	0.0013
PAH 1	6.525	0%	6.525
PAH 2	39.470	98%	0.789
PAH 3	25.250	98%	0.505

4. History of Efforts at Hickey Run

Overview

Hickey Run and the surrounding area of the National Arboretum has been the subject of multiple environmental assessments, site investigations, and environmental cleanups. Documentation of these activities, and relevance to the proposed stormwater BMP at the New York Avenue outfall, if any, is provided in this section.

4.1 US Army Corps of Engineers – Anacostia Federal Facilities Impact Assessment

In October 2002, the US Army Corps of Engineers (USACE), Baltimore District released the *"Anacostia Federal Facilities Impact Assessment."* This four-volume document assesses the adverse impacts of the 22 federal facilities in the Anacostia River watershed and then describes

plans for reducing and eliminating the impacts. The report provides a summary of existing conditions and a federal facility management plan (Volume 1); divides the study into an upper and lower comprehensive report (Volumes 2 and 3); and provides a compendium of BMPs, recommended project selection criteria and objectives, and potential funding and partnering opportunities (Volume 4).

The report describes the Hickey Run urbanized subwatershed and concludes that the majority of the pollution is in two forms:

- Fuels, oil, greases, and other pollutants associated with transportation
- Trash and floatable debris washed from the streets and discarded by the population working, living, and traveling in the watershed.

The report describes an oil boom 15 feet south of the New York Avenue outfall, maintained by Washington Metropolitan Area Transit Authority (WMATA), that "traps petroleum and hydrocarbons and to a lesser extent, floating debris," but states that the system's ability to trap all the pollution is limited.

The Federal Facility Management Plan lists proposed "priority projects" in FY02 dollars. Projects were prioritized using an "impact score." Five projects were identified for the USNA, although only the first project corresponds to the scope of work for this contract. The five projects are summarized in table entitled, USACE Anacostia Facility Management Plan Priority Projects, below.

Table 13: USACE Anacostia Facility Management Plan Priority Projects, Washington DC.

Project	Estimated Cost (FY02 $)
1. Install trash rack and absorbent booms along Hickey Run	1,900,000
2. Stabilize Hickey Run stream banks and improve aquatic habitat	275,000
3. Increase storage capacity of Heart and Beech Spring Ponds	1,250,000
4. Construct an extended detention shallow marsh wetland at Springhouse Tributary	1,000,000
5. Decrease impervious surface surrounding composting facility and increase riparian buffer width	33,000

To implement the first project, the report specifically recommends installing a continuous deflection separation (CDS) unit as recommended in the Center for Watershed Protection (CWP) in addition to four to six petroleum- and hydrocarbon-absorbent booms between New York Avenue and Hickey Lane. An implementation time of two to three years is estimated for design, permitting, regulations, and construction of the CDS unit. It also states the booms could be installed in 30 days. The $1,900,000 cost estimate does not include maintenance. The report states that in 2001, Congress appropriated $500,000 for the design and construction documents for this project and that DCDOH agreed to provide $1,400,000. However, the January 2004 MOU (described below) clarifies that the funding for the Hickey Run BMP is provided via two Congressional appropriations. Compliance and permitting issues identified include a Corps 404 or 401 permit, DCRA Stormwater Regulations, a sediment and erosion control plan if more than

5,000 square feet of soil is disturbed, and potentially a National Environmental Policy Act (NEPA) review.

Two alternatives were considered but were not selected. The first was the installation of an oil/water separator at the outfall. It is stated that "subsequent studies and investigations into the nature of petroleum pollution entering from the New York Avenue outfall indicated that a major portion is entering Hickey Run during storm events," but the high flow rates associated with storm events are too large for an oil/water separator. The second was the use of an extended detention wetland to absorb pollutants. It was determined that "a man-made wetland may not provide sufficient water quality improvement to justify its space, construction, and intensive maintenance requirements."

The report also recommends a BMP for Hickey Run and the USNA. In this report, BMPs are defined as "cost effective solutions that federal facility managers can implement to reduce maintenance burdens, lower costs, and improve the overall health of the watershed, typically without requesting additional funds." The report recommends that the USNA work with local groups and officials to address the trash issue by conducting volunteer cleanup events and post signs throughout the USNA and Hickey Run watershed to elevate environmental awareness at a maximum cost of $25,000 (FY02 $). A number of general low impact development (LID) concepts are also recommended in Volume 1.

The second project is currently being implemented by the US Fish and Wildlife Service (USFWS) and is described in the US Fish and Wildlife Assessment, described below. The third project is essentially a recommendation to implement the Stormwater Management Conceptual Design included in the USNA Master Plan. This report, which recommends constructing two in-line ponds along Hickey Run in the USNA, is described in The Center for Watershed Protection – Innovative Stormwater Treatment in Hickey Run and National Arboretum, described below. The fourth project consists of a two-phase implementation with the first phase installing a trash collection system on Springhouse Run upstream of the proposed marsh. The second phase entails the construction of an extended detention wetland and landscaping. The fifth project, "Decrease impervious surface surrounding composting facility and increase riparian buffer width," assumes that the composting facility at the USNA contributes to nutrient loading of Hickey Run. This assumption and the necessity of this project has been questioned by USNA staff.

4.2 Draft Site Inspection Report for the USNA

In November 2000, ENTECH, Inc. produced a *Draft Site Inspection (SI) Report* for the USNA. The objective of this SI Report was to overcome deficiencies in previous studies in order to determine whether contaminants were present at the identified site areas of concern (AOCs) and to develop analytical and supporting data sufficient to support a Hazard Ranking System (HRS) evaluation. Several previous environmental studies have been completed at this site since 1991. These studies have focused on identifying locations throughout the USNA where hazardous substances may have been released to environmental media. These studies were used in

conjunction with other site-specific and regional data to evaluate the USNA's eligibility for placement on the National Priority List (NPL) using the HRS.

In this SI, ten potential AOCs were initially identified for further evaluation. The former brickyard facility and parking lot area were eliminated from further consideration. Selected sampling was conducted of sediment, surface soils, surface water, and groundwater and analyzed for metals, pesticides, polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs). These results were compared to potential pathways of exposure scenarios, likelihood of releases, and target populations. Background surface water and sediment sampling was performed at Hickey Run at the New York Avenue outfall.

With this information a HRS score was developed for the site. The overall HRS score for the site was 18.80. This HRS score fell well below the 28.50 cutoff for further consideration by USEPA for inclusion on the NPL. This SI Report concluded that the concentration of contaminants detected at the site was generally not elevated. Further, there were no discernable trends in the sampling data that was indicative of a source of contamination associated with the AOCs at the site. Based on the evaluation of this data, a recommendation of "No Further Response Action Planned" (NFRAP) was proposed for the USNA under CERCLA. Additional cleanup under RCRA is described in the section entitled, Documentation of leaking UST at Building 15.

The ENTECH report contains the only known water quality sample at the proposed BMP location at New York Avenue (ENTECH table entitled, Hickey Run Fecal Coliform Bacteria TMDL-USEPA Report). However, this sample was taken as a single "background" sample and was not tested for the purpose of stormwater pollution abatement. Metals, pesticides, and soluble volatile organic compounds were tested, but no data is provided for oil/grease, hydrocarbons, trash/floatables, or nutrients.

4.3 Environmental Assessment Report for the USNA Master Plan

An Environmental Assessment (EA) conducted in accordance with NEPA guidelines was completed in conjunction with, and in order to address the environmental effects of the USNA Master Plan 2000. Earth Tech obtained a copy of the EA from ARS dated October 6, 2000 which supercedes the November 24, 1999 EA in the Master Plan document. The EA addresses the environmental effects on:

- Hydrology and wetlands
- Soils and topography
- Air quality
- Noise
- Water supply
- Wastewater and stormwater
- Energy conservation strategies
- Traffic and transportation, and
- Historic and aesthetic considerations.

The EA acknowledges Hickey Run's long history of petroleum related pollution and its classification as a priority watershed for special treatment by the government agencies overseeing

the environmental restoration. The report states that pollution enters the stormwater prior to reaching the USNA and is primarily from two sources:

- Fuels, oils, greases, and other pollutants associated with the transportation industry
- Trash and floatable debris wash from the streets and discarded by the population working, living and traveling in the watershed.

In order to mitigate construction noise associated with the Master Plan, the EA recommends strict adherence to all applicable federal, state, and local noise ordinances, with no construction activity commencing prior to 6:00 a.m. or terminating later than 6:00 p.m. Additional recommendations for mitigating noise are also provided.

Consistent with the Master Plan, the Brick Yard is identified as a major historic development that should be maintained. The entire Arboretum is classified as a Category II Landmark and is listed on the National Register of Historic Properties.

4.4 Natural Resources Investigation: Site Analysis and Environmental Assessment for the USNA Master Plan

In June 1998, a report entitled, *"Natural Resources Investigation: Site Analysis and Environmental Assessment"* was submitted for the USNA as a part of the Master Plan. The report documented the current conditions of the natural resources within the confines of the USNA in order to provide a basis for the Master Plan's EA.

The report provides a summary of aquatic resource characteristics for Hickey Run, a tributary stream, several brooks, and nine artificially created ponds or pools. Also included is an evaluation of the five wetland areas identified at the USNA site. The overall condition of the aquatic resources was found to be degraded and most were considered to need remedial action.

A thorough description of vegetation was provided. While three forest stands in the Arboretum were found to be excellent examples of the vegetation that once covered the Washington, DC area, other stands showed signs of considerable disturbance over a period of decades.

The report discussed the wildlife species and evidence of wildlife observed during the site examination. Summary tables of expected wildlife species at the USNA were provided. At the time of the report fourteen animals and six plant species were identified as threatened or endangered in the State of Maryland and, by geographic proximity, the District of Columbia, which could potentially be found at the site. The USNA lacks the habitat typically required for both the animal and plant species identified and therefore their presence is unlikely. The bald eagle was the only species identified as a realistic factor that could potentially affect planning at the USNA. The report indicated that no living organisms were observed in Hickey Run.

4.5 Documentation of Leaking UST at Building 15

Two separate reports document the removal of one leaking 550-gallon diesel underground storage tank (UST) at Building 15 on the USNA site. The first report, prepared by Applied Environmental and dated August 15, 1991, details the actual excavation and removal of this UST. During excavation, petroleum contaminated soils were present in the tank excavation indicating that a release had occurred. A more extensive program of subsurface exploration, including the drilling of soil borings and installation of observation wells, was subsequently conducted to delineate the extent of contamination and evaluate the risks to human health and environment.

The actual extent of contamination included a free product plume extending approximately 240 feet long by 45 feet wide (the estimated quantity, assuming a thickness of 2 inches, is 13,400 gallons). The zone of petroleum contaminated soils extended approximately 350 feet from east to west and a maximum of approximately 100 feet from north to south, with most of the soils at depths greater than 10 feet below ground surface.

This report concluded that there is a potential for the petroleum contamination to reach Hickey Run. Additionally, surface water runoff from the areas near Building 015 would enter Hickey Run downstream of the "second containment boom" (maintained by USNA and located just north of the Hickey Lane Bridge). However, this report further noted that there is no evidence that diesel fuel is currently being conveyed at the time of this report from the Building 015 site to Hickey Run by the storm sewer system. However, Applied Environmental considered it appropriate to monitor the stormwater entering Hickey Run via the outfall near the Hickey Lane Bridge for free product and dissolved petroleum hydrocarbons.

The second report prepared by Waste Tron of Maryland and dated April, 1999 details the additional monitoring and site remediation activities conducted at the former location of the Building 015 leaking UST. According to this report, a series of monitoring wells (MW-1 through MW-22) were installed downstream of the leaking UST site with free product collected from the wells over the period from August 1991 up until August 1997.

Waste Tron conducted a follow up geoprobe subsurface investigation in September 1997. Results of this investigation indicated low levels of petroleum contamination in the soil and groundwater in approximately 60% of the boring locations. It was determined that the contamination was primarily concentrated at depths of 17 to 20 feet (just above the impermeable clay layer). Contamination also was localized along a southwestern path from wells MW-8B to MW-16C. It was proposed that the contaminated area be excavated to the depth of the impermeable clay layer with soil being removed for treatment and groundwater from the excavation being pumped to a holding tank for transfer to a wastewater treatment facility. Remediation was to be conducted in two phases – Phase 1 included the area east of New York Avenue entrance driveway from MW-8 to MW-13; Phase 2 included the area between the New York Avenue entrance driveway and the paved parking area from MW-21 to a point beyond MW-17.

Phase 1 was conducted from March 26 to April 8, 1998. Over 1,242 tons of contaminated soil were excavated and transported to soil recycling facilities. Approximately 27,700 gallons of

groundwater (in the three-foot zone above the impermeable clay layer) was pumped and treated. Twenty-two soil samples were collected from the excavation to verify that the contaminated soil had been removed and that the remaining soil was clean. One groundwater sample was analyzed with results indicating low levels of total petroleum hydrocarbon (TPH) and benzene, toluene, ethylbenzene, and xylene (BTEX).

Phase 2 remediation activities were completed from June 15 to June 29, 1998. Only minor quantities of groundwater were encountered in Phase 2; therefore it was not necessary to pump and treat any groundwater from the excavation. A total of 221.55 tons of contaminated soil was excavated and transported to a recycling facility for treatment. Soil sample laboratory results for TPH diesel range organic were less than 1 parts per million for all samples.

Based on these activities and the results of soil and groundwater sampling, it was recommended by Waste Tron that no further remedial actions were necessary and site closure was appropriate.

4.6 Apex Environmental, Inc. – Preliminary Assessment/Site Investigation

Apex Environmental, Inc. conducted a Preliminary Assessment/Site Investigation (PA/SI) for the USNA in February 1991. This PA/SI identified seven areas on the USNA property where disposal or storage of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substances may have occurred. The seven potential CERCLA sources included: the gravel pit, the shops area, the Anacostia River dump, the old greenhouse ravine, the current greenhouses, the brickyard area, and the golf course dump site.

Only five of the seven potential CERCLA sources warranted further consideration. The brickyard and golf course areas were removed after further review because both included the disposal of non-CERCLA hazardous substances, specifically petroleum.

A HRS pre-score was calculated for this site based on an evaluation of ground water migration, surface water migration, air migration, and on-site exposures. The initial HRS pre-score was 56.32. Therefore, a SI was recommended as specified in the National Contingency Plan (NCP).

The results of the SI identified levels of CERCLA hazardous substances above background in each of the five source areas sampled. Those substances most commonly detected were metals and pesticides. In general, the levels of hazardous substances detected were not considered to pose a significant threat to human health and the environment. This SI was used to calculate another HRS pre-score. The HRS scores for the USNA decreased significantly from the PA to the SI, lowering to 8.77. These results indicated that the USNA did not qualify for NPL listing. This report did recommend the following site cleanup activities: surface clean up of the old greenhouse ravine; surface clean up of the gravel pit and restriction of site access; and surface clean up of the Anacostia River dump, particularly in the area of the former pistol range. The report recommended further investigation, resulting in the ENTECH Site Investigation (Section entitled, Draft Site Inspection Report for the USNA).

5. Past Stormwater Pollution Abatement Studies

Overview

Throughout the 1990s, the MWCOG via David Shepp performed multiple studies and implemented steps to greatly decrease the oil and grease pollution in Hickey Run. Since then, three additional studies have provided recommendations to further improve water quality. The USACE Impact Assessment described in the section entitled, US Army Corps of Engineers - Anacostia Federal Facilities Impact Assessment, provides multiple solutions and concept rankings to resolve the pollution and streambank degradation problems. Two additional studies below provide more comprehensive proposals for pollution abatement for Hickey Run.

5.1 Hickey Run Sub-Watershed Action Plan by Shepp

This 1991 report by Shepp provides a description of the Hickey Run subwatershed, land use, and drainage network. It also contains a characterization of the watershed at the time of the report, including an assessment of the pollution and environmental degradation problem. The report was prepared for the Soil Resources Management Division, Environmental Regulation Administration, DCDCRA.

The proposed action plan prioritized four items. First, control the petroleum hydrocarbon pollution at the sources. Second, control the end-of-pipe stormwater runoff by installing three extended detention shallow marshes on the main stem and tributaries. Shepp recommends a marsh to capture the first 0.5-inch of runoff from the watershed area. Third, restore the channel and habitat areas. Fourth, restore nearby off-line areas.

5.2 Hickey Run Comprehensive Pollution Abatement Program (Phase I and II) by Shepp

The Phase I 1993 report prepared by Shepp outlines three major tasks related to pollution abatement on Hickey Run. A detailed map of the existing storm sewer network was developed and a map of land use and associated imperviousness was prepared. These items were field verified. Various sources of non-point pollutants and related pathways were identified and mapped. Based on the sewer system information and potential pollutant sources, a hydrocarbon spill storm drain tracing system was developed.

Phase II was completed in 1995 and included development of the storm drain tracing program. A description of the system, operation and maintenance needs and anticipated costs, and recommendations for additional projects were provided.

Both reports were prepared for the Water Resources Management Division, Environmental Regulation Administration, DCDCRA.

5.3 US Fish and Wildlife Service Assessment

In November 2004, the USFWS Chesapeake Bay Field Office completed a draft of the “Hickey Run, Washington, DC Watershed and Stream Assessment.” The executive summary from this document was made available to Earth Tech and a summary of relevant information is provided below. Please note that this information is from a draft copy and all information is subject to

change. This assessment is part of a larger USFWS project to construct demonstration sites in three of the six tributaries and a 30% design for streambank restoration of the main stem of Hickey Run by summer/fall of 2005.

The Executive Summary states that DCDOH and USFWS entered into a MOU in 2001 to restore streams and riparian habitat in the District's watersheds. This resulted in a stream-based assessment of Hickey Run. A Rosgen Level I stream assessment was performed for the tributaries of Hickey Run and Rosgen Level II, III, and IV assessments were performed for the main stem. Two of the six reaches on the Hickey Run mainstem have significant instability problems and are a high restoration priority. Preliminary restoration costs for all of Hickey Run's 2.3 miles @ $302 per linear foot are estimated to be $3,667,488.

5.4 Center for Watershed Protection - Innovative Stormwater Treatment in Hickey Run and National Arboretum

In 2001, the Center for Watershed Protection (CWP) delivered a series of memoranda to the USEPA Chesapeake Bay Program pertaining to stormwater treatment for Hickey Run. This collection of documents is the most comprehensive study of stormwater pollution abatement solutions available for Hickey Run. The memoranda are summarized below.

5.4.1 Task 1a – Review of Site Conditions and Engineering Plans – February 27, 2001

This memorandum summarizes CWP's review of existing engineering plans and interviews with project partners. It describes a 1991 proposal to construct an on-line extended detention shallow marsh between New York Avenue and Hickey Lane at a cost of $550,000. Subsequent to that proposal, a hydrocarbon storm drain tracing system was designed and implemented. In 2000, Jewell Engineering proposed an automated traveling screen trash rack at the New York Avenue outfall with absorbent booms at a cost of $362,000.

The Jewell Engineering report provided Hickey Run flow estimates based on a 1986 study by Chang, et.al. CWP then performed a hydrologic analysis of the Hickey Run watershed using Urban Hydrology for Small Watersheds model TR-55 developed by USDA-NRCS. Note that The TR-55 model was designed to analyze runoff patterns during a 24-hour single storm event. TR-55 formulas are used in most engineering firms, soil conservation districts, and municipalities around the country. As of 1994, more than 300,000 copies of the TR-55 manual have been sold by the U.S. National Technical Information Service. The NRCS methods used in TR-55 are very effective in evaluating the effects of landcover/land use changes and conservation practices on direct runoff. For more information about TR-55, see the following website: *http://www.wcc.nrcs.usda.gov/hydro/hydro-tools-models-tr55.html*

The report recommends installing a technology to treat 0.4 inches of rainfall, fully treating about half of the average annual events and a portion of the larger events. It is also stated that this flow rate is at the upper limits of available technologies.

A baseflow of 1 to 2 cfs was estimated since little information was found about the stream's baseflow. This is based on a rule of thumb of 1 cfs per square mile of drainage.

5.4.2 Preliminary Summary of Hickey Run Retrofit Design and Estimated Pollutant Removal Performance – April 6, 2001

The memorandum states that it is desirable to treat the first 0.5 inches of rainfall, but that due to limitations in available technologies' capacities and budget (a construction budget of $320,000 was assumed), only the first 0.25 inches of rainfall can be fully treated. It also estimates the potential removal of oil and grease in the proposed technology via two methods. First, using assumptions from the Hickey Run oil and grease TMDL and skimmer removal efficiencies, CWP predicts 30% of the target removal would be accomplished. Second, using the Simple Method and hydrocarbon data from previous studies, CWP predicts 31% of the target removal would be accomplished. The memorandum concludes that other means of controlling oil and grease upstream in the watershed should be explored and that additional funding would help treat a larger percentage of the stormwater. Finally, CWP recommends implementing some of the USNA's Master Plan wet pond or shallow marsh options, which can achieve as much as 85% of hydrocarbon removal.

5.4.3 Task 1c – Review of Innovative End-Of-Pipe Stormwater Techniques – April 6, 2001

This memorandum describes 12 proprietary products that could be used to treat stormwater in Hickey Run. Each product was evaluated for:

- Flow or treated area
- Trash removal
- Oil and grease removal
- Other pollutant removal
- Storage capacity
- Installed location
- Maximum footprint

In addition, each product was compared for capital cost, maintenance cost, maintenance requirements, and maintenance equipment.

Two promising technologies were the CDS technology and the Netting Trash Trap. Both are primarily used for floatable trash removal, but can be augmented with booms to achieve oil and grease removal. These two technologies also had the highest capital costs.

5.4.4 Hickey Run Watershed Management Approach – June 5, 2001

This memorandum summarized a meeting that described a comprehensive approach to stormwater management for the Hickey Run watershed. The comments described using education and outreach to reduce oil and grease releases, installing upstream treatment devices, providing a CDS unit (supplemented with oil sorbents) at the New York Avenue outfall to treat a 0.25-inch rainfall, installing a Netting Trash Trap at the Hickey Lane culvert, and providing a downstream off-line surface water feature, such as a wetland. It was estimated that a 7.7-acre, 1-foot-deep wetland would be needed to treat 0.25-inch of rainfall. The cost for a 7.7-acre wetland was $245,000.

5.4.5 Innovative Stormwater Treatment in Hickey Run and National Arboretum – December 18, 2001

The final memorandum from the Center for Watershed Protection (CWP) provides a summary of previous findings and conceptual-level designs for the recommended options and a cost estimate. CWP recommended a "two-pronged approach" with a CDS unit to capture up to 0.25-inch storms and a Netting Trash Trap downstream of the CDS unit. An 80-foot diversion weir was proposed to divert 64 cfs to the CDS unit. A preliminary hydraulic analysis concluded that this weir would not result in upstream flooding. The table entitled, CWP Recommendation Options summarizes approximate costs for the recommended option.

Table 14: CWP Recommended Options

Item	Approximate Cost
CDS unit capital costs	$448,000
CDS unit annual maintenance and materials	$4,000
Netting Trash Trap capital costs*	$130,000
Netting Trash Trap annually maintenance and materials*	$82,000

*Netting Trash Trap costs are for Option 1, a 5-bag system. Option 2, a 7-bag system, costs are higher.

5.5 Marshall Tyler Rausch, LLC Stormwater Management Conceptual Design for Hickey Run Subwatershed (USNA Master Plan)

Marshall Tyler Rausch, in conjunction with Jewell Engineering, prepared a Stormwater Management Conceptual Design for the Hickey Run Subwatershed as part of the USNA 2000 Master Plan. This report, dated October 7, 1999, provides background information on Hickey Run, pollution issues, and 13 recommendations for improving water quality in Hickey Run. Recommendations 9 through 13 are provided in the event that Recommendation 7 cannot be implemented. Those recommendations are summarized below in the table entitled, USNA Master Plan Hickey Run Recommendation, below. Cost estimates were provided for five of the recommendations that were most likely to be performed by USNA as part of a capital improvements program in conjunction with the USNA Master Plan.

Table 15: USNA Master Plan Hickey Run Recommendations.

Recommendation	Description	Approximate Cost
1	Support the implementation of a pollution abatement program for the Hickey Run watershed	
2	Construct automated trash racks to intercept trash and debris flowing into the Arboretum	$234,000
3	Install absorbent booms to intercept petroleum and hydrocarbon pollution	$11,000
4	Remove and replace the concrete walls along Hickey Run between Hickey Lane and the sanitary sewer crossing	$154,000
5	Repair the sanitary sewer where it crosses Hickey Run	$12,000
6	Investigate the condition of the sanitary sewer that crosses the Arboretum and perform repairs as needed	
7	Construct two ponds on Hickey Run between the sanitary sewer crossing and Crabtree Road	$633,000
8	Stabilize the tributaries which discharge into Hickey Run	

9	Restore Hickey Run's access to adjacent floodplains	
10	Restore additional meanders to Hickey Run	
11	Restore a riparian buffer along Hickey Run and Tributary 1 [Springhouse Run]	
12	Restore habitat diversity in the stream bed of Hickey Run	
13	Use a blend of armoring and bioengineering to stabilized the streambanks of Hickey Run	

6. Relevance to Regional and Local Initiatives

6.1 Chesapeake Bay Program

The District of Columbia and the States of Maryland, Virginia, and Pennsylvania, the USEPA, and NOAA, are signatories to the 1983 Chesapeake Bay Agreement. The purpose of the Chesapeake Bay Program is to restore the resources of Chesapeake Bay and its tributaries to full productivity for the benefit of regional residents, the coast-wide economy, and the national welfare by reducing the flow of runoff and contaminants into the Bay and its tributaries. While the District has no regulations specifically implementing the Chesapeake Bay Program, its ordinances for erosion and sedimentation control and stormwater management support the mission of the program by regulating the quality of surface runoff into the Anacostia River, which is a tributary of Chesapeake Bay (US General Services Administration, October 2003).

6.1.1 Chesapeake Bay 2000 Agreement

The restoration goals of Hickey Run are closely aligned with those of the *Chesapeake Bay 2000 Agreement*, as signed by the District of Columbia, Virginia, Maryland, Pennsylvania, the Chesapeake Bay Commission, and the U.S. Environmental Protection Agency. The Hickey Run restoration strategy will support the goals of: "Living Resource Protection and Restoration" for fish passage, "Water Quality Protection and Restoration" for reduction of nutrient and sediment loads and for the protection of priority urban waters, "Sound Land Use" by helping to revitalize a degrading urban neighborhood, and by increasing voluntary stewardship of natural resources through public education and community engagement.

Through coordinating activities with various District agencies and community organizations, a more comprehensive plan to address the full spectrum of restoration needs in the watershed can be created. As a result, each individual component will support the success of the entire effort so that the stream and park ecology can return to a sustainable state.

Note that a TMDL for Hickey Run is a milestone in the District's NPS Management Plan II.

7. Vision of Stormwater Pollution Reduction

7.1 MOU for Water Quality BMP at New York Avenue Outfall

The future of Hickey Run as a healthy, viable stream rests to a great extent with the USDA, Agricultural Research Service (ARS) US National Arboretum (USNA). Although the cause of the stream's impairment is primarily due to phenomenon occurring north of ARS property, no rehabilitation can occur without the explicit involvement and commitment of the National Arboretum.

Discussions with the National Arboretum began almost three and a half years ago (July 1999) in cooperation with the Chesapeake Bay Program (CBP) to address stormwater and stream instability issues. In the last three and a half years we have had various meetings with Dr. Thomas Elias, Director of the Arboretum and his staff regarding these very issues.

In March 2004, representatives of the USNA; DCDOH; and DCWASA finally agreed upon and signed a six-page Memorandum of Understanding (MOU). The objective of this MOU is to document a partnership between those three entities "for the purpose of improving water quality of Hickey Run, in part to achieve the goal of complying with District of Columbia Law 13-311, the 'Stormwater Permit Compliance Act of 2000.'" The MOU specifies the use of $2,188,950 by ARS to design and construct a floatable debris control (FDC) system and an oil and grease pollution abatement (OGPA) system (BMP) at the Hickey Run outfall, funded via two Congressional appropriations; $1.7M provided in the Conference Report to the FY2003 Consolidated Appropriations Act for the Hickey Run pollution abatement activities at the USNA (Conf. Rep. No. 10, 108th Cong., 1st Sess. 559 (2003) and $500,000 provided in the Conference Report to the FY2001 Appropriations Act to the District of Columbia, which was subsequently transferred to the USNA for this purpose.

As a result of this MOU, DCWASA assumes responsibility for the operation and maintenance of the BMP. The MOU states that the estimated annual maintenance of the BMP will be $75,000, but that this estimate will be reviewed 18 months after the start-up of the systems.

> "2.2 WASA, as delineated in section 6.0 below, shall be responsible for operation and maintenance (O&M) of the constructed facilities. O&M shall mean: collection and disposal of the floatable debris from the FDC system; replacement of the oil absorbent material or collection and disposal of the accumulated oil in the OGPA system; and performance of system checks after storm events**.** Subject to the terms of a separate easement (attached), ARS will grant WASA and its contractors the right to access the USNA for the operation and maintenance of the Systems."

DCDOH will perform post-implementation monitoring of the BMP.

It is important to note that the proposed location of the pollution abatement system at the New York Avenue outfall will only treat a portion of the stormwater that flows to the Anacostia River in Hickey Run. Not only do the storm sewers not carry all of the Hickey Run watershed stormwater, but also the New York Avenue outfall only passes approximately 83% of all the stormwater that is collected in storm sewers. Therefore, a BMP installed at New York Avenue will only be able to treat approximately 65% of the whole watershed. Relocating the BMP to an area downstream of the confluence of Hickey Run and Springhouse Run would allow treatment of almost all of the watershed stormwater.

7.2 Stream Rehabilitation

It is also important to note that this same MOU stipulates that the three agencies will also work to develop a stream rehabilitation plan;

> "2.3 DC, FWS and ARS will work jointly with any and all other appropriate agencies in the development of a stream restoration plan. Any plan developed will be in concert with the USNA mission and is subject to ARS approval. Every attempt will be made to have this plan developed and agreed upon prior to completion of the construction of the pollution abatement system."

The watershed consists of a network of stormwater pipes and natural streams. In 1861, Hickey Run had over five miles of streams consisting of fifteen tributaries and a drainage density of 2.40 mi/mi^2. Today, the watershed consists of the Hickey Run main stem and six small unnamed tributaries, totaling 2.3 miles, all on the U.S. National Arboretum (USNA) or Anacostia Park, National Park Service (NPS). Even though there is significantly less stream miles, the current drainage density is 3.82 mi/mi^2 due to the miles of stormwater pipes that drain the upper and middle portions of the watershed. (USFWS Assessment Report 2004)

The goal of stream restoration is generally to return a stream to a stable, self-maintaining state. Stream stability is not a static state but a dynamic process with a tendency towards an equilibrium between stream discharge, sediment transport and channel dimension, planform patterns and longitudinal profile. Restoring a stream to this stable state and restoring its riparian buffer addresses a number of aquatic and riparian habitat concerns. A successful stream restoration improves water quality in many ways, including sediment and nutrient reduction, which are significant issues for the Chesapeake Bay and its natural resources.

In 2003, DOH spent $73,700 plus $18,630 in In-kind services from the USFWS to do a Level III assessment of the Hickey Run watershed. A final draft of assessment was completed in September of 2004. As part of the Level III assessment, the Service conducting a detailed assessment of the stream's physical characteristics and fluvial processes. The Service established a stream health and stability baseline condition to monitor changes and to validate stream stability predictions. The Service also developed a "cause and effect" relationship of fluvial processes occurring to identify and prioritize stability and habitat problem areas. See Appendix A for a detailed description of the project tasks for a Level III assessment.

7.3 Findings from 2004 USFWS Assessment

The majority of tributaries, except where piped, appear physically unaltered by channelization activities and free to adjust naturally. The Service delineated twenty-eight separate stream reaches, representing twelve different Rosgen stream types, based on geomorphologic character and stability conditions. Instream habitat conditions are fair to good in most tributaries with some poor

areas. The riparian buffer ranges in width from 20 to 1,300 feet and consists mostly of mature woodlands with some areas consisting of woody shrubs and non-native species. Overall, the tributaries are relatively stable (72 percent vertically stable, 68 percent laterally stable), and only slightly incised (60 percent rated as low to moderate), but have a very high potential sediment supply on a majority of the tributaries (51 percent). Recovery potential of the degraded areas is poor and will only occur if the cause of the instability is corrected.

The Service partitioned the mainstem of Hickey Run into six reaches based on geomorphologic character and stability conditions and identified three Rosgen stream types. The entire main stem has been physically altered and nearly half has been hardened into place with either large rip rap or concrete. In most areas where it has not been hardened, it is actively eroding (67 percent laterally and 47 percent vertically adjusting). Fifty seven percent of the reaches are severely incised and entrenched. Instream habitat diversity and cover quality varies from poor to moderate. Water quality is impaired by urban runoff, sewer line leaks, and past petroleum leaks. The riparian buffer varies from mowed grass to wide, mature woodlands. The potential sediment supply is very high. The Service predicts approximately 1,100 tons of sediment erodes from the streambanks of Hickey Run annually. The potential for Hickey Run to recover on its own given its current condition is poor.

Changes in the watershed and physical alterations to the Hickey Run are the primary causes for instability, poor water quality and aquatic habitat problems. High percentages of impervious surface in the watershed, along with conversion of many of the tributaries to piped or concrete-line storm drains have altered Hickey Run's natural hydrology. Base flows (groundwater derived flow) are lower than in a predominantly forested or agricultural watershed, and stormflow peaks are of greater intensity but shorter duration (flashiness). These higher flows and greater velocities have caused and are still causing stream erosion and channel incision throughout Hickey Run.

7.3.1 Restoration Priority

The Service determined that all, but two, of the reaches on the Hickey Run main stem have significant, widespread instability problems and considers the restoration priority as high. Although there is a discernable difference in stability between the reaches, the severity of instability of all the reaches are such that rating the restoration priority of one reach over another is not warranted. The stability conditions of the tributaries vary from stable, to localized instability, to widespread instability. However, because all the tributaries are relatively short, the Service recommends that restoration occur at a tributary level, regardless of the individual reach restoration priority.

7.3.2 Restoration Recommendations

The Service recommends a natural channel design approach to restoring degrading areas on Hickey Run and its tributaries. One of the more significant stream problems to address when restoring Hickey Run is the degree of incision. Based on the natural channel design methodology, restoration techniques of incised streams are divided into four major categories (Rosgen 1997).

- Create the original type stream at the original floodplain level (Priority 1)
- Create the original type stream at the current floodplain level or higher, but containing a floodprone area (Priority 2)
- Create a different type stream without an active floodplain, but containing a floodprone area (Priority 3)
- Stabilize the existing stream with structures (Priority 4)

The Service determined that a Priority 1 or 2 restoration is appropriate for most of the Hickey Run main stem and its tributaries. There are some confined areas of Hickey Run where a Priority 1 or 2 restoration may not be feasible. For those potential areas, the Service recommends using a Priority 3 restoration. The morphology of all priority stream types generally provides good habitat potential for fish and macroinvertebrates, and reduces stream width and stream incision.

To address water quality problems in Hickey Run, DOH and USNA are currently working together to install an oil separator and trash collector near New York Avenue where Hickey Run daylights from a stormwater pipe. However, as the project is currently sized, it may be inadequate to deal with larger flows, and implementation of best management practices at stormwater production sites in the upper watershed is an important part of the overall strategy, which DOH is addressing in their watershed implementation plan.
Storm sewer outfalls must be addressed on a case-by-case basis. The preferred alternative is to treat stormwater on site. Another alternative is to relocate outfalls to the edge of riparian corridors and install stormwater treatment and infiltration facilities. In some cases, because of space and grade limitations, this may not be possible. Where relocation is not feasible, energy dissipaters may be required to improve stream stability.

The Service derived Hickey Run restoration costs based on restoration costs developed as part the Oxon Run Stream Restoration Concept Development (Shea, et al, 2004). The restoration costs include construction costs only and are applied on a linear foot cost at the rate of $230.00. Preliminary restoration costs for Hickey Run are $1.2 million. The Service will refine the restoration costs during the design phase as details of restoration solutions and their locations are finalized.

As a stream restoration will take place in lands maintained by the USNA, it must accommodate the needs and mission of the USNA, while accounting for the limits placed on stream restoration potential by the poor water quality originating from the highly urbanized watershed. (USFWS Assessment Report, 2003) It is envisioned that Hickey Run will become a model for urban stream restoration and an integral part of the National Arboretum's natural experience instead of a trash and stormwater conveyance channel to be hidden behind fences and shrubs. This vision will be realized when the stream channel is restored with stable, meandering, dynamically aggrading and degrading stream with vegetated banks; when the water supports an expanded diversity of aquatic life, and meets the EPA approved Total Maximum Daily Load (TMDL) for oil and grease; and when the residents and business leaders of the watershed understand their very important connection to water.

The potential impact to pollutant loads of comprehensive stream (mainstem and tributaries) restoration project of all 2.3 miles (12,144 feet) of streambank would be as follows based upon the listed efficiencies:

Table 16: Estimated pollutant reduction efficiencies and annual reduction in pounds per year for N, P and Sediment resulting from complete stream rehabilitation, Hickey Run, Washington DC.

Nitrogen		**Phosphorus**		**Sediment**	
Abatement Efficiency	*Reduction (lbs/yr)*	*Abatement Efficiency*	*Reduction (lbs/yr)*	*Abatement Efficiency*	*Reduction (lbs/yr)*
0.02	**243**	0.00035	**4.3**	2.55	**30,966 (15.4 tons)** *[*100,000s of thousands of pounds /year]*

*Note that current estimates of sediment load to the Anacostia from Hickey Run stream banks (main stem and tributaries) is 1100 tons (2,200,000 pounds) per year. This will be validated via monumented cross section in the Fall 2005 by USFWS. Until this validation is complete, we will assume sediment abatement of 30.966 pounds or 15.4 tons per year resulting from stream rehabilitation. If the monumented cross-sections validate the estimate of 1100 tons per year of sediment loss from Hickey Run and its tributaries and if complete restoration is implemented, we expect total sediment abatement to increase by many orders of magnitude.

7.4 Hickey Run Watershed Comprehensive Low Impact Development (LID) Retrofit

Potential LID sites were identified within the watershed. The drainage area that would be captured by implementation of LID design was measured and used to calculate efficiencies for these potential sites.

The following represent sites have been identified by the Watershed Protection Division staff as locations that could potentially be used for the implementation retrofitted with LID BMPs. The table below provides information on the location, BMP suggested and size of treatment area accommodated by the BMP suggested of each site. As the WPD moves forward with encouraging the installation of LID within each watershed, this table can be referred to as a means of deciding the best areas for initial investment. By no means is this list final. We expect that other opportunities will present themselves as development alters the landscape. We reserve the right to amend this list and submit it anew. All proposed locations have a catch basin nearby for overflow and underdrain connection thereby increasing there feasibility.

Table 17: Location of proposed BMP retrofit and expected treatment area, Hickey Run watershed, Washington DC.

Location (NE)	**Proposed LID BMP**	**Approximate Total Treatment Area (square feet)**
22nd and Rand St.	2 Tree boxes*	4000
24th and Rand St.	4 Tree boxes	16,000
R and Bladensburg	1 Biocell** possible to treat Bladensburg runoff, SE corner	2000

U-Haul Facility Parking lot, Montana and Bladensburg	1 Biocell to treat parking lot runoff	3000
Montana (south of 17th St) (Willy's Autobody)	1 Biocell in public space to treat street runoff	5500
17th street	1 Biocell along both sides of street.	4300
Police Repair Facility (17th street)	Permeable pavers on heavily used parking lot could be retrofitted with	7000
West Virginia (between 15th and 17th in front of cemetery)	1 Biocell, South side of street to treat street runoff from W. Virginia	8000
16th and W. Virginia	1 Biocell on NE corner of street to capture runoff from parking lot and 16th street	9000
Okie St (Hechts)	2 Tree boxes	8000
16th between NY Ave and Okie, West side	1 Biocell to treat 16th street runoff and adjacent UNPAVED parking lot runoff.	10,000
NY Avenue access road International Limousine	1 Biocell along border of parking lot and access road to treat parking lot	8000
Washington Times Parking and Distribution Center Parking lot (NY Ave)	3 Biocells in parking lot	9000
USPS V Street Annex Parking Lot (V and 33rd)	1 Biocell in parking lot	10,000
USPS Facility on 33rd and Higdoll St.	1 Biocell in large parking	12,000
Metro employee parking lot 31st and Ames	1 Large Biocell along access road behind USPS V street Annex	20,000
31st and Ames, NE corner	2 Biocells along northern periphery of parking lot in public space, to treat parking lot.	5000
Teamsters Union Building	1 Large biocell possible in public space to treat 31st and Ames St. runoff.	4500
33rd between Adams and Ames St.	1 large biocell in parking lot.	5000
33rd and Ames street have no curbs and parked cars causing heavy erosion which must be addressed.	1 Large biocell in public space to treat Ft. Myers Construction Co, parking lot runoff and 33rd street runoff	10,000
Channing and 30th, SW corner	1 Tree box	5000
Douglas and 31st, NW, NE, SW corners	1 Tree box	5000
South Dakota and Bladensburg Rd, Sammy's Liquors	1 Tree box	5000
Apple Road Dead end	1 Biocell at end of street	5000
Ft. Lincoln Park Tennis courts and swimming pool parking lots	1 Biocell at end of street	6000
30th and Evarts St.	2 Biocells to treat parking lots	6500
Western end of Evarts Road	1 Tree box, NE corner of street.	5000
Western end of Douglas St.	1 Biocell at end of street	6000
Western end of Adams Rd.	1 Biocell at end of street	6000
Bladensburg and Channing Rd, east side of Bladensburg along periphery of p-lot.	1 Biocell at end of street	6500
P-lot at corner of Bladensburg and V street (USPS)	1 Biocell to treat parking lot.	8000
Metro Bus repair facility Bladensburg and V street.	1 Biocell to treat parking lot.	10,000
DC Govt Facility at Adams and Queens Chapel	2 Biocells in parking lot all along southern periphery	15,000
Lawrence St (And Edwin)	2 Biocells in parking lot	6000
Confluence of 22nd and Queens Chapel Road	1 Large biocell	10,000
Washington Center Home 18th Street.	2 Tree boxes	8000
17th and Downing.	1 Biocell at southern end of parking lot	4000
Dead end of Channing (east off of 18th)	1 Tree box on NW corner.	5500
Evarts and 17th St.	1 Biocell at end of street to treat street runoff.	6500
24th and Channing Rd, along train tracks.	3 Tree boxes, on NW, SW and SE corner.	15000
Douglas Avenue, eastern end of street near train tracks	1 Biocell to collect stormwater at this low corner. Natural springs on this street causing constant seepage.	5000
Evarts and 26th Street	1 Biocell to collect stormwater at lower corner.	4300
Franklin and 17th.	1 Biocell near train tracks to collect street runoff.	6500
Franklin and 18th	3 Tree boxes, on NW, NE and SW corners.	18,000
24th and Franklin	(8 tree boxes) 3 in-line tree boxes at SW corner of intersection, and 3 on SE corner, and 2 on each side of catch basin on NW corner.	50,000

Langdon School parking lot (20th and Franklin)	2 Tree boxes, on SE and SW corner.	10,000
Girard and 18th.	1 Biocell along northern side of parking lot.	5500
Public Park, corner of Franklin and 18th St.	2 Tree boxes, on NW and SW corner.	10,000
20th between Hamlin and Franklin Sts.	2 Biocells inside park property treating runoff from both Franklin and 18th streets.	12000
Girard and 16th St.	1 Biocell inside park property midway down 20th on western side treating runoff from 20th.	6000
17th and Girard St.	1 Biocell on NW corner, pubic space to treat street runoff	9000
Hamlin and 17th St.	1 Biocell ,SW corner public to treat street runoff	3300
Brentwood and 17th St.	1 Tree box, SW corner	9000
P-lot at corner of 17th, Brentwood and Hamlin	1 Tree box, NW corner	12000
Irving and 18th St.	1 Biocell at western corner to accept runoff from parking lot.	3200
18th and Hamlin St.	2 Tree boxes, on NW and NE corners.	15,000
Hamlin and King St.	1 Tree box on NE corner.	15,000
Mills and Hamlin, NE corner of pubic park	1 Large biocell inside park on southern side of Hamlin Street to treat street runoff.	7000
24th and Hamlin	1 Large biocell inside park on southern corner to treat street runoff.	7500
17th and Bryant	1 Tree box on NE corner.	6000
17th and Bryant	1 Biocell on eastern side of Bryant south of the entrance to development to treat street runoff.	7000
Total LID BMPs: 38 Tree Boxes; 52 Biocells		**Total Proposed Treatment Area: 525,600 sq feet [12 acres] total treatment area.**
Cost by Practice: 38 Tree boxes * $19k/TB* = $728,000 52 biocells *avg. of $30k/biocell = $1,560,000**		**Total LID Retrofit Cost: $2,288,000**

*Assuming 12 ft. x 6 ft. FILTERRA® tree box treating maximum of ~21,780 sq ft, maximum of first half inch of single rain event only.
**Biocell size is assumed to be 10% that of treatment area. BMP size is often dictated by space available for BMP as opposed to total drainage area of that micro-sewershed.
***12 foot by 6 foot FILTERRA® costs $14,200 plus 35% for installation= ~$19,000 per TB.

The following table provides information on area and load reduction for LID retrofits.

Table 18: Pollutant load reductions by specific area, Hickey Run watershed, Washington DC.

Location (NE)	**TN***		**TP***		**TSS***	
	Load (lbs/yr)**	**Rdx*** (lbs/yr)**	**Load** (lbs/yr)**	**Rdx*** (lbs/yr)**	**Load** (lbs/yr)**	**Rdx*** (lbs/yr)**
22nd and Rand St.	1.70	**0.85**	0.22	**0.09**	146.35	**131.72**
24th and Rand St.	6.81	**3.40**	0.88	**0.35**	585.40	**526.86**
R and Bladensburg	0.85	**0.43**	0.11	**0.04**	73.18	**65.86**
U-Haul Facility Parking lot, Montana and Bladensburg	1.28	**0.64**	0.17	**0.07**	109.76	**98.79**
Montana (south of 17th St) (Willy's Autobody)	2.34	**1.17**	0.30	**0.12**	201.23	**181.11**
17th street	1.83	**0.91**	0.24	**0.10**	157.33	**141.59**
Police Repair Facility (17th street)	2.98	**1.49**	0.39	**0.15**	256.11	**230.50**
West Virginia	3.40	**1.70**	0.44	**0.18**	292.70	**263.43**

(between 15th and 17th in front of cemetery)						
16th and W. Virginia	3.83	**1.91**	0.50	**0.20**	329.29	**296.36**
Okie St (Hechts)	3.40	**1.70**	0.44	**0.18**	292.70	**263.43**
16th between NY Ave and Okie, West side	4.25	**2.13**	0.55	**0.22**	365.88	**329.29**
NY Avenue access road International Limousine	3.40	**1.70**	0.44	**0.18**	292.70	**263.43**
Washington Times Parking and Distribution Center Parking lot (NY Ave)	3.83	**1.91**	0.50	**0.20**	329.29	**296.36**
USPS V Street Annex Parking Lot (V and 33rd)	4.25	**2.13**	0.55	**0.22**	365.88	**329.29**
USPS Facility on 33rd and Higdoll St.	5.11	**2.55**	0.66	**0.27**	439.05	**395.15**
Metro employee parking lot 31st and Ames	8.51	**4.25**	1.11	**0.44**	731.75	**658.58**
31st and Ames, NE corner	2.13	**1.06**	0.28	**0.11**	182.94	**164.64**
Teamsters Union Building	1.91	**0.96**	0.25	**0.10**	164.64	**148.18**
33rd between Adams and Ames St.	2.13	**1.06**	0.28	**0.11**	182.94	**164.64**
33rd and Ames street have no curbs and parked cars causing heavy erosion which must be addressed.	4.25	**2.13**	0.55	**0.22**	365.88	**329.29**
Channing and 30th, SW corner	2.13	**1.06**	0.28	**0.11**	182.94	**164.64**
Douglas and 31st, NW, NE, SW corners	2.13	**1.06**	0.28	**0.11**	182.94	**164.64**
South Dakota and Bladesburg Rd, Sammy's Liquors	2.13	**1.06**	0.28	**0.11**	182.94	**164.64**
Apple Road Dead end	2.13	**1.06**	0.28	**0.11**	182.94	**164.64**
Ft. Lincoln Park Tennis courts and swimming pool parking lots	2.55	**1.28**	0.33	**0.13**	219.53	**197.57**
30th and Evarts St.	2.77	**1.38**	0.36	**0.14**	237.82	**214.04**
Western end of Evarts Road	2.13	**1.06**	0.28	**0.11**	182.94	**164.64**
Western end of Douglas St.	2.55	**1.28**	0.33	**0.13**	219.53	**197.57**
Western end of Adams Rd.	2.55	**1.28**	0.33	**0.13**	219.53	**197.57**
Bladensburg and Channing Rd., east side of Bladensburg along periphery of p-lot.	2.77	**1.38**	0.36	**0.14**	237.82	**214.04**
P-lot at corner of Bladensburg and V street (USPS)	3.40	**1.70**	0.44	**0.18**	292.70	**263.43**
Metro Bus repair facility Bladensburg and V street.	4.25	**2.13**	0.55	**0.22**	365.88	**329.29**
DC Govt Facility at Adams and Queens Chapel	6.38	**3.19**	0.83	**0.33**	548.81	**493.93**
Lawrence St (And Edwin)	2.55	**1.28**	0.33	**0.13**	219.53	**197.57**
Confluence of 22nd and Queens Chapel Road	4.25	**2.13**	0.55	**0.22**	365.88	**329.29**

Washington Center Home 18th Street.	3.40	**1.70**	0.44	**0.18**	292.70	**263.43**
17th and Downing.	1.70	**0.85**	0.22	**0.09**	146.35	**131.72**
Dead end of Channing (east off of 18th)	2.34	**1.17**	0.30	**0.12**	201.23	**181.11**
Evarts and 17th St.	2.77	**1.38**	0.36	**0.14**	237.82	**214.04**
24th and Channing Rd, along train tracks.	6.38	**3.19**	0.83	**0.33**	548.81	**493.93**
Douglas Avenue, eastern end of street near train tracks	2.13	**1.06**	0.28	**0.11**	182.94	**164.64**
Evarts and 26th Street	1.83	**0.91**	0.24	**0.10**	157.33	**141.59**
Franklin and 17th.	2.77	**1.38**	0.36	**0.14**	237.82	**214.04**
Franklin and 18th	7.66	**3.83**	1.00	**0.40**	658.58	**592.72**
24th and Franklin	21.27	**10.64**	2.77	**1.11**	1829.38	**1646.44**
Langdon School parking lot (20th and Franklin)	4.25	**2.13**	0.55	**0.22**	365.88	**329.29**
Girard and 18th.	2.34	**1.17**	0.30	**0.12**	201.23	**181.11**
Public Park, corner of Franklin and 18th St.	4.25	**2.13**	0.55	**0.22**	365.88	**329.29**
20th between Hamlin and Franklin Sts.	5.11	**2.55**	0.66	**0.27**	439.05	**395.15**
Girard and 16th St.	2.55	**1.28**	0.33	**0.13**	219.53	**197.57**
17th and Girard St.	3.83	**1.91**	0.50	**0.20**	329.29	**296.36**
Hamlin and 17th St.	1.40	**0.70**	0.18	**0.07**	120.74	**108.66**
Brentwood and 17th St.	3.83	**1.91**	0.50	**0.20**	329.29	**296.36**
P-lot at corner of 17th, Brentwood and Hamlin	5.11	**2.55**	0.66	**0.27**	439.05	**395.15**
Irving and 18th St.	1.36	**0.68**	0.18	**0.07**	117.08	**105.37**
18th and Hamlin St.	6.38	**3.19**	0.83	**0.33**	548.81	**493.93**
Hamlin and King St.	6.38	**3.19**	0.83	**0.33**	548.81	**493.93**
Mills and Hamlin, NE corner of pubic park	2.98	**1.49**	0.39	**0.15**	256.11	**230.50**
24th and Hamlin	3.19	**1.60**	0.41	**0.17**	274.41	**246.97**
17th and Bryant	2.55	**1.28**	0.33	**0.13**	219.53	**197.57**
17th and Bryant	2.98	**1.49**	0.39	**0.15**	256.11	**230.50**
	TN*		**TP***		**TSS***	
	Load (lbs/yr)**	**Rdx*** (lbs/yr)**	**Load** (lbs/yr)**	**Rdx*** (lbs/yr)**	**Load** (lbs/yr)**	**Rdx*** (lbs/yr)**
Total	**223.61**	**111.80**	**29.07**	**11.63**	**19,230**	**17,307**

*Assuming urban stormwater concentrations of 172 mg/l TSS, 0.26 mg/l TP and 2.00 mg/l TN; and 41 inches annual rainfall. Also assuming 100% pollutants mobilized at first half in rain event or less.

**Loading = 0.226 * R * C * A; Where: L = Annual load (lbs), R = Annual runoff (inches), C = Pollutant concentration (mg/l), A = Area (acres), 0.226 = Unit conversion factor.

***Assume both biocell and treebox removal efficiencies of 50% for TN, 40% for TP and 90% for TSS.

8. Public Awareness and Outreach: Vision of Community

The urbanization of the Anacostia watershed has taken a toll on the river and its tributaries. Buildings, streets, sidewalks and sewer systems have been built specifically to collect stormwater and transport it to stream channels for efficient conveyance away from the structures that it might harm. Oil and grease from automobiles, trash from convenience products, fertilizers and

pesticides applied to lawns, and the relatively common illegal dumping of contaminants all collect on paved surfaces and travel with the stormwater runoff to the streams.

In the context of the District's highly urbanized watersheds, Hickey Run is quite industrial with impaired waters making it an excellent candidate for integrated community stewardship. Stewardship efforts have repercussions not only for local residents and in the upper watershed, but also for those thousands who visit the US National Arboretum every year.

These sources of pollution originate from many individual actions - driving a car, fertilizing a lawn before the rain, tossing a plastic bag into the storm drain - that have been identified as nonpoint source pollution (NPS). A program to educate the public on the effects of urban NPS pollution on aquatic resources, that also provides guidance for the prevention of NPS pollution will be an important component of the watershed restoration.

Target populations for this effort include individuals, businesses, developers, and government agencies residing and working in the Hickey Run Watershed. Particularly active and/or interested residents can tie-in to numerous citizen advisor committees that address larger Anacostia River issues. These include the Citizen Advisory Committee of the Soil and Water Conservation District, and the Citizen Advisory Committee of the Metropolitan Washington Council of Government's AWRC and the USNA Citizens Advisory Committee.

Most recently, the Interstate Commission for the Potomac River Basin (ICPRB) has been given a grant award by MWCOG to do community outreach and education in the Hickey Run watershed during the Fall 2005, Winter 2005/2006 and Spring 2006. We are poised to meet with ICPRB to discuss a joint outreach strategy. This program will use a variety of educational tools to implement this project. The community will be informed about recent efforts in the watershed and educated about sources and effects of and prevention practices for NPS pollution. To reach residents and community leaders, we envision ICPRB staff will be posting information, attending community meetings, holding stakeholder meetings, providing community educational events, and addressing classrooms. Ecologix Inc., a subcontractor to EarthTech, the prime contractor for the design and construction of the BMP at the NY Avenue outfall has been actively engaging all stakeholders in the watershed.

8.1 EE-CARS Program

In late 2001, the DCDOH initiated the Environmental Education for the Compliance of Auto Body Shops (EE-CARS), a voluntary ERP. The purpose of this project is to improve compliance with DC business licensing and environmental regulations and promote use of best management practices at small scale auto repair shops (20 or less employees). EE-CARS is expected to help small auto repair shops reduce their environmental, health, and quality of life impacts on their local neighborhoods. The program also is designed to build relationships between DC government and small businesses, local community organizations, and trade associations. EECARS is now being implemented as a pilot project in Ward 5 of the District (which includes all of Hickey Run watershed; See Ward Map below), a neighborhood that has 109 businesses that meet DC's definition of small auto repair and body shops. If successful, DCDOH plans to expand EE-CARS to other Wards in the District.

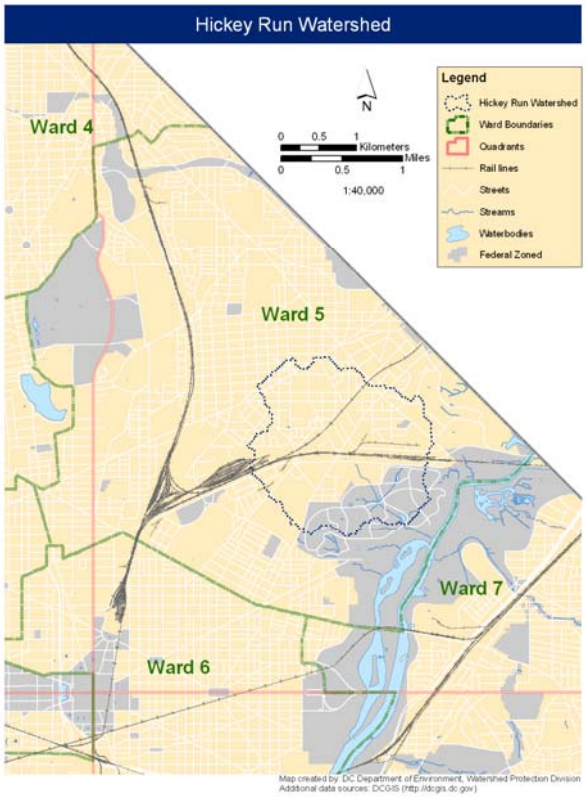

Figure 6: Ward Map of Washington DC with Hickey Run watershed.

DCDOH has fostered improved coordination with other branches of DC government responsible for regulating auto repair and body shops, and has raised awareness about compliance requirements among small auto repair shops.

In the last phase of the project, in May - June 2004, 43 randomly selected shops received multimedia inspections by teams of EPA and District Government inspectors. The 2004 inspections were compared with the baseline inspections conducted in May of 2002. The 2004 inspections found a 36% increase in the compliance of auto repair and autobody shops with D.C. auto shop license requirements and certificates of occupancy, an increase in the cleanliness and professionalism of the shops' appearances (both inside and out) and an increase in the number of shops presenting evidence that they disposed of used oil and hazardous wastes through used oil recyclers and hazardous waste disposal companies. In addition to the inspections, the shop owners were allowed to voluntarily self-certify their compliance. Too few Self-Certification Forms were returned to draw any conclusions from the self-certifications. The District is evaluating whether to further develop the project for implementation in other wards of the city. See: http://www.epa.gov/permits/erp/auto.htm#dc

8.2 List of Hickey Run Stakeholders

8.2.1 Community and Environmental Organizations:

Anacostia River Business Coalition: Terri White, Steve Saari
Anacostia Riverkeeper: David Smith
Anacostia Watershed Citizens Advisory Committee: Bill Mataczeski, Tom Aarasmith, Carl Reeverts
Anacostia Watershed Society: Robert Boone
Anacostia Watershed Toxins Alliance (AWATA): Fred Pikney,
Chesapeake Bay Foundation Anacostia Initiative: Doug Siglin
Friends of the National Arboretum (FONA): Kathy Horan, Woody Price, Rindy O'Brien, Sally Boasberg
Herb Society of America: Ann Abbott
National Bonsai Foundation: Johann Klodzen
National Capitol Area Federation of Garden Clubs: Carol Carter, Ellen Spencer
Potomac Riverkeeper: Ed Merrifield
Turf Grass Association: Kevin Morris

8.2.2 Agencies:

Center for Watershed Protection: Glenn Page, Hye Yeong Kwon, Ted Brown
DCDOH: Dr. Hamid Karimi, Sheila Besse
DCWASA: Barry Lucas, John Cassidy
EPA: Reggie Parrish
Interstate Commission for the Potomac River Basin: Joe Hoffman, Steve Saari
Metropolitan Washington Council of Governments: John Galli
US Fish & Wildlife Service: John Wolflin, Rich Starr, Tamara McCandless, Connor Shea
USACE NAB: Chris Correale
USNA: Dr. Elias
WMATA: Joan LeLacheur

The District has been an active participant in the Anacostia River Business Coalition (ARBC), that includes over 130 members including Metro, Pepco, Washington Gas, and many smaller business owners, and will continue to work with them to increase the number business owners / operators who take responsibility for polluting operations.

Finally, DOH must identify codes, regulations, and processes of the District government that inhibit conversion to low impact infrastructure and redevelopments, and use this opportunity to integrate environmental programs where they are needed in District business. In the long run, the NPS Management Program hopes to fund a mass media campaign that will popularize its environmental message and reach a larger audience.

This outreach program will be coupled with investigation and enforcement to identify potential polluters, and attach financial responsibility for remediation to those polluters.

9. Implementation Strategy/Recommendations/Actions

The following recommendations for restoration of the Hickey Run Watershed should be taken into consideration.

Action 1: Reduce non-point source pollution generated in the upper urban watershed and reduce peak flow of concentration during storm events of half an inch or less. This would primarily involve comprehensive and systematic use of strategically placed LID BMP retrofits to treat stormwater quality and to a lesser extent, stormwater quantity. Potential reductions of TN (76.6 lbs/yr) and TSS (5.9 tons/year) are significant at a cost of $1.94 million for design, construction and permitting.

Action 2: Installation of trash rack and oil/grease separator on USNA property at NY Avenue outfall in order to intercept floatable trash and debris and the majority of PAHs flowing into the Arboretum for all half inch to one inch rain events. Expected abatement is not yet known as a specific technology has not been chosen at this time in the project cycle. Although note that NY Avenue outfall passes 83% of all stormwater by volume, or 63% of the total watershed, by area. We do know that total PAH loading estimated at 88.8 pounds per year in 1998 at the NY Avenue outfall. Reduction of 70-80% of floatable oil and grease will be possible with the new BMP.

Action 3: WASA is slated to repair the sanitary sewer at two problem sites where it crosses Hickey Run to avoid further direct contamination of the river by sewage leaks. According to WASA, plans have been drawn up to do such repairs and are planned for 2006. We expect an 86% reduction in MPN/100mL as a result of this infrastructure upgrade.

Action 4: Rehabilitate 3 high priority tributaries (see Figure below). 100% design plans for 3 tributaries to Hickey Run (all on USNA property) and 30% design plans for the mainstem will be complete later in 2005. Potential pollution abatement of TN and TSS could be significant, at 243 lbs year and a very conservative 15.4 tons per year respectively. Note: If USNA does not allow stream rehabilitation, we have the option of working with USFWS to create a wetland where Hickey Run meets the Anacostia. Placement of a wetland would serve to treat water quality before it enters the Anacostia River.

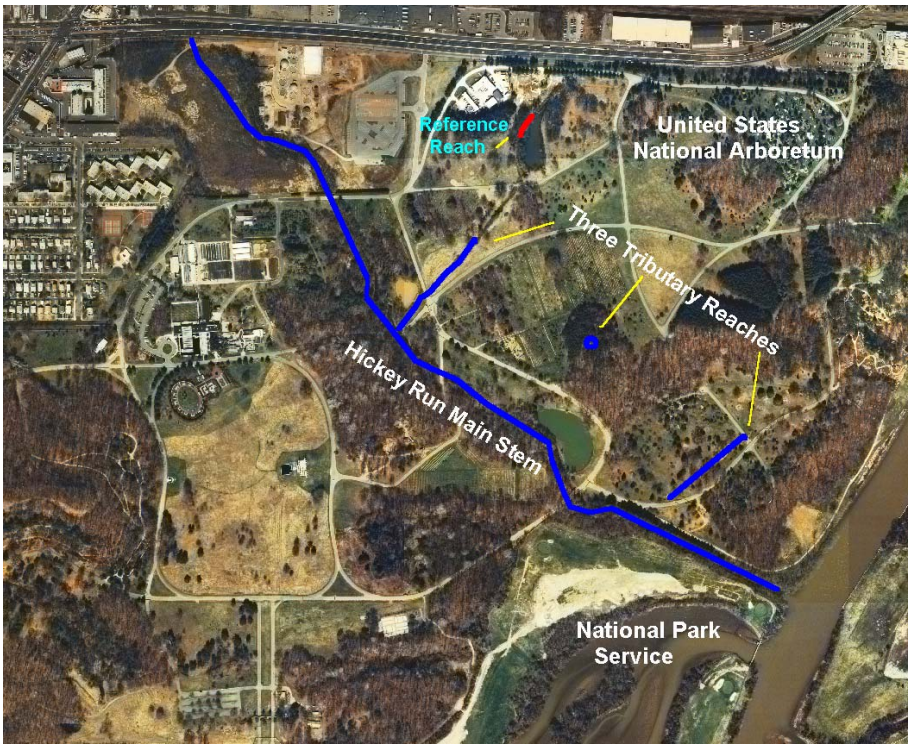

Figure 7: Three high priority tributary reaches to Hickey Run main stem, Washington DC.

Action 5: Work with ICPRB via their grant from MWCOG to initiate comprehensive community education and outreach on current pollution abatement efforts planned on USNa property. Community should be educated about implications of excessive fertilizer use for lawn care, as well as the implications of improper garbage disposal. Annual trash surveys (as noted above) have not demonstrated a clear annual trend in floatables concentrations in the mainstem of Hickey Run between 1998 and 2003. DOH Water Quality Division has historically done outreach and education to automotive repair facilities in order to reduce illegal dumping of automotive liquids (oil, coolant etc). This needs to be repeated. Coordination with ICPRB will be sought on this endeavor.

Action 6: Rehabilitation of Hickey Run mainstem and remaining 3 tributaries using natural channel design in order to create a stable stream channel and stream bed with the necessary habitat diversity (pools and riffles) to support wildlife. Estimated cost $3,289,988. Effect on TSS could be as much as 1-2 million pounds per year (500 – 1000 tons) if all 2.3 miles of stream were restored. Note: If USNA does not allow stream rehabilitation, we have the option of working with USFWS to create a wetland where Hickey Run meets the Anacostia. Placement of a wetland would serve to treat water quality before it enters the Anacostia River.

10. Deliverables/Timeline/Budget

The following table summarizes the tasks outlined above, including funding requirements

Table 19: Deliverables/Timeline/Budget.

Schedule of Tasks and Milestones

Schedule of Tasks and Milestones			
Task	**Completion Date**	**Amount Budgeted**	**Funding Source**
Trash Rack and Oil & Grease Separator	Summer 06	$2.7 million	$2,688,950 was been set aside for this purpose; $1.7M provided in the Conference Report to the FY2003 Consolidated Appropriations Act for the Hickey Run pollution abatement activities at the USNA (Conf. Rep. No. 10, 108th Cong., 1st Sess. 559 (2003) and $500,000 provided in the Conference Report to the FY2001 Appropriations Act to the District of Columbia.
ICPRB Community Environmental Outreach in Watershed	Fall 2005, Winter 2005/2006 & Spring 2006	????	MWCOG Grant to ICPRB
DC WASA Replacement of Hickey Run Sewer line/interceptor to eliminate sewage leaks.	Spring 2006	????	????
Stream Restoration Phase I: USFWS Stream & Watershed Assessment	Fall 2004	$207,700	EPA 319 Grant
Stream Restoration Phase II :Concept Designs (100% designs for 3 tributaries and 30% designs for mainstem)	Fall 2005	$194,430 (plus $48,610 In-kind Service USFWS = $234,040 total)	EPA 319 Grant

Schedule of Tasks and Milestones			
Stream Restoration Phase III: Restoration/Implementation of 3 high priority tributaries using 100% Design Plans	Spring 2006	$377,500 @ $302/linear foot * 1250 total feet (includes design, construction and construction management.)	EPA 319 Grant
Stream Restoration Phase IV: 100% Design Plans for remaining 3 tributaries and mainstem	Spring 2008	Assume Total design costs of $300,000.	EPA 319 Grant
Stream Restoration Phase V: Rehabilitation/Implementation of remaining 3 tributaries and mainstem of Hickey Run.	2009	Cost of $3,289,988 (10,894 linear feet @ $302/ linear foot).	EPA 319 Grant
Comprehensive 5 Year Retrofit of LID BMPs throughout watershed	2006-2010	$2,288,000 (Design, construction, permitting)	EPA 319 Grant

11. Total Annual Projected Source Load Reductions

Based upon the latest numbers for load reductions as supplied by the EPA Chesapeake Bay Program technical review group, the following represents the expected load reductions that could be achieved by implementing the actions presented in this document.

Table 20: Total Expected Reductions for Hickey Run watershed, Washington DC.

Method	TN reduction lb/yr	TP reduction lb/yr	TSS reduction lb/yr
Stream restoration[*]	**243**	**4.3**	**30,966 (15.5 tons)**
Total LID BMP retrofit	**111.8**	**11.6**	**17,307 (8.7 tons)**
Reductions from NY Avenue BMP	**Not applicable****	**Not applicable****	**Not applicable****
Total potential	**354.8**	**15.9**	**48,273 (24 tons)**

reduction			

*Note that if validation of sediment loss from Hickey Run proves accurate, restoration of the mainstem and tributaries could result in potential abatement of 1-2 MILLION pounds of sediment per year.

**The NY Avenue BMP for oil and grease abatement and floatables collection is not being designed to nor is it expected that the possible technologies being considered would affect TN, TP or TSS loading.

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13. LIST OF ACRONYMS AND ABBREVIATIONS

AOC Area of Concern
ARS Agricultural Research Service
BMP Best Management Practice
BTEX Benzene, Toluene, Ethylbenzene, and Xylene
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
cfs Cubic feet per second
CWA Clean Water Act
DCDCRA District of Columbia Department of Consumer and Regulatory Affairs
CDS Continuous Deflection Separation
CFR Code of Federal Regulations
CWP Center for Watershed Protection
DCDOH District of Columbia Department of Health
DCMR District of Columbia Municipal Regulations
DCWASA District of Columbia Water and Sewer Authority
EA Environmental Assessment
HRS Hazard Ranking System
lbs/day Pounds per day
LID low impact development
mg/L Milligrams per liter
mL Milliliter
MOU Memorandum of Understanding
MPN Most Probable Number
MS4 Municipal Separate Storm Sewer System
MWCOG Metropolitan Washington Council of Governments
NAVFAC Naval Facilities Engineering Command
NCP National Contingency Plan
NEPA National Environmental Policy Act
NFRAP No Further Response Action Planned
NPDES National Pollutant Discharge Elimination System
NPL National Priority List
PA/SI Preliminary Assessment/Site Investigation
PCB Polychlorinated Biphenyl
SVOC Semivolatile Organic Compound
TMDL Total Maximum Daily Load
TPH Total Petroleum Hydrocarbon
USACE US Army Corps of Engineers
USDA US Department of Agriculture
USEPA US Environmental Protection Agency
USFWS US Fish and Wildlife Service
USNA US National Arboretum
VOC Volatile Organic Compound
WMATA Washington Metropolitan Area Transit Authority